COAL AGE

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THERE is always some incentive back of every worth-while effort. Success may be due to the force of a good example; it can result from the steadying influence of sound advice; or, again, necessity often compels the individual to exert his powers so frequently that habits of industry are formed, and in accord with a fortunate arrangement in the mental and moral economy of our nature, that which is performed as a duty soon becomes a habit, and the action of the human being is determined for good.

The best support of character is the exercise of the will, and this is the habit most essential to cultivate. When the will is weakened, the trained nerves continue to repeat the daily acts, even when the doer abhors them. What we at first choose, at last compels, and the threads we weave each day soon form a cable which cannot be snapped. There is no greater truism than "the chains of habit are too small to be felt until they are too strong to be broken."

What a man will do in any emergency, whether it is a mine fire, an explosion, or other disaster, is determined almost wholly by his first unthinking impulse, and the latter depends entirely on the habits of the individual. From earliest youth, our best and most lasting instruction consists in habits, not in reasonings; in examples, rather than in direct lessons.

It is therefore a fact that habit has most to do in shaping our lives, and "force of example" is the chief influence in the determination of habit. Precept may point the way, but example is silent, continuous, forceful instruction, operating imperceptibly, but with absolute certainty.

Believing it is the influence of acts, more than words, that molds and shapes human character, we will commence in March to publish in COAL AGE each week a study of the career of some one successful coal man. Supplementing each biography, will be an interview giving the opinions of the subject of the sketch on important coal-mining problems, thus making each account a story of much technical value.

Furnishing the world's fuel has grown to be a monster industry, and the men who have advanced the art of mining to its present state overcame difficulties in a way that is worthy of record. The sketches will be written of men who are at present in the thick of of things—the ones who, through merit, have pounded their way to the front, whether they started from a room in a mine or a room in a college.

Although we will treat only of men who have so far succeeded in life, it must be understood that we realize failure has its Plutarch as well as success. It is doubtful, however, whether failure is an object that ought to be set before us. Nothing is so easy to learn as "how not to do a thing"; it needs neither effort, teaching, perseverance nor judgment. Of course, the best of us may fail, and failure in a good cause is honorable, while success in any bad cause is merely infamous; however, success in the good cause is undoubtedly better than failure.

In conclusion, we desire to say that this new department, "*WHO'S WHO IN COAL MINING*," will be created for the sole purpose of elevating the man, and thereby the industry, through the influence of human example and practical advice. Many a foreman, superintendent or engineer whose face is pointed in the right direction, but who is daunted by present difficulties, would hesitate no longer in getting a fresh grip if only the incentive was there. Most of us need to be reminded that "Any Man Can Do What Any Other Man Has Done."

The Trinidad District in Colorado

By F. W. Whiteside*

This is the first of two articles describing coal operations in southern Colorado, one of the most important districts in the West. This initial description covers the geology, power plants and haulage systems.

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The Trinidad field is a portion of a large coal-bearing area lying along the Front Range in the southern part of Colorado. It extends from the state line on the south to the north line of Las Anomas County, a distance of 30 miles, and from the east exposure of the Front Range, west to the foot of the Sangre de Christos a distance averaging 22 miles. The field contains about 425,000 acres.

General Conditions

Trinidad, a flourishing town of 12,000 inhabitants, is the commercial center of this district. The Atchison, Topeka & Santa Fe, the Denver & Rio Grande, the Colorado & Southern, the Colorada & Wyoming and the Colorado & South-Eastern railroads all enter here. These railroads and their branches handle the entire output of the district. A small percentage of the coal mined is hauled directly to the consumer by wagon from the mines. All the larger properties load their coal directly into railroad cars.

South of an imaginary line extending west from a point about midway between Ludlow and Lynn all the coal mined will make coke of high commercial value. Large quantities of this product are shipped to the steel works of the Colorado Fuel & Iron Co. at Pueblo, to various copper properties in Arizona and Mexico, to a number of smelters, to a rapidly increasing number of gas-producer plants in Colorado and New Mexico and to a large domestic trade in the larger cities of eastern and central Colorado.

North of this line the coal, although still bituminous in character, will not coke successfully. This characteristic adds to, rather than detracts from, its value as a steam coal, as the non-coking coals are certainly superior for firing purposes.

Generally speaking, the market supplied with coal and coke from the Trinidad district embraces New Mexico, Texas, Oklahoma, Kansas, Nebraska, Mexico and Colorado. By this statement, it is not intended to convey the idea that all the coal and coke used in the above named states is mined in and shipped from the Trinidad district. There are other coal-producing districts which ship into the same territory, but the Trinidad coal holds an important place in the these markets. That the district supplies a great volume of the locomotive fuel used by the large trunk lines which enter the state is a fact which plays an important part in governing the production of all its mines.

Geology

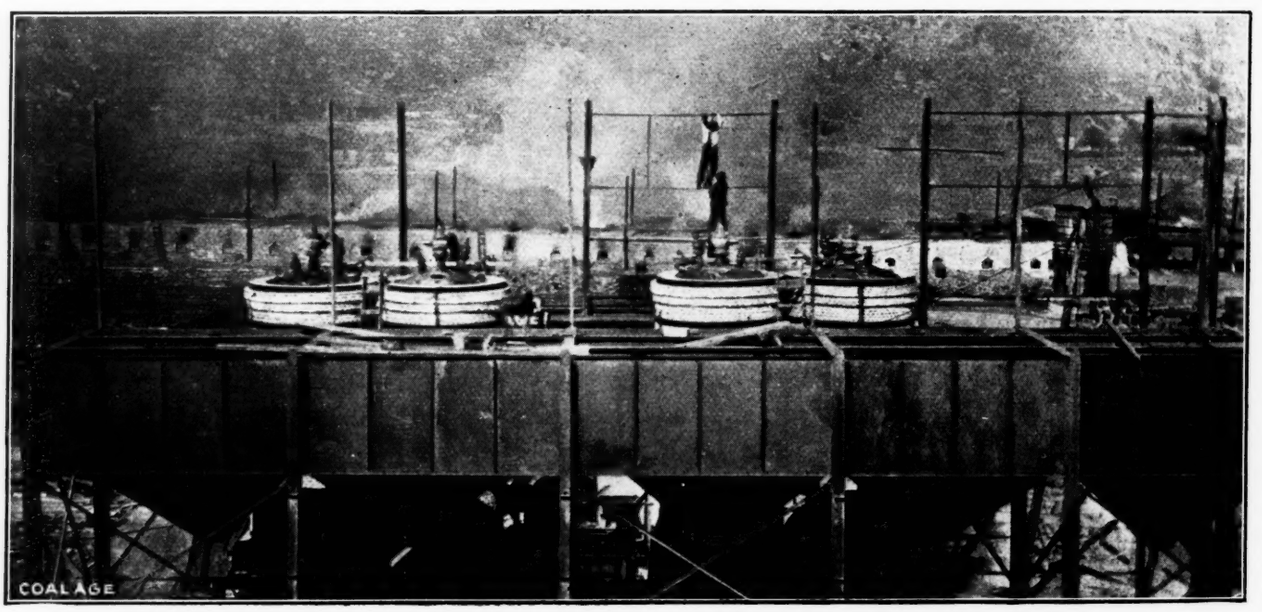
The Trinidad field is a part of the Raton Mesa Coal region, being separated from what is generally known as the Raton field in New Mexico by the Colorado-New Mexico state mine, each town giving its own name to its particular field.

All the coal-bearing regions along the Front Range in eastern Colorado, namely, the Denver, Colorado Springs, Canon City, Walsenburg and Trinidad districts belong to the Laramie formation and lie between five and nine thousand feet above sea level, those in the Trinidad field being between six and nine thousand feet.

The various coal seams are usually identified according to their distance above the Trinidad or Basal sandstone, which underlies all the coal measures in this district. Its thickness varies from 150 to 250 ft. Under this sandstone deposit is found the Pierre shales with a thickness of about one thousand feet.

The Laramie, or coal formation, rests upon the Trinidad sandstone and varies in thickness from one to three thousand feet. It consists of alternate layers of feldspathic sandstone and clayshale, with workable coal seams intersperced with considerable irregularity.

Igneous rocks occur in great quantities in certain portions of the field, proving that the region at some time must have been the scene of great volcanic activity. The intrusion of Fisher and the Spanish peaks undoubtedly destroyed vast areas of valuable coal. In many



Coal Bunkers for Central Power Plant at Hastings

localities, great masses of igneous rock have been intruded into the strata and large deposits of lava are found.

Igneous Intrusions

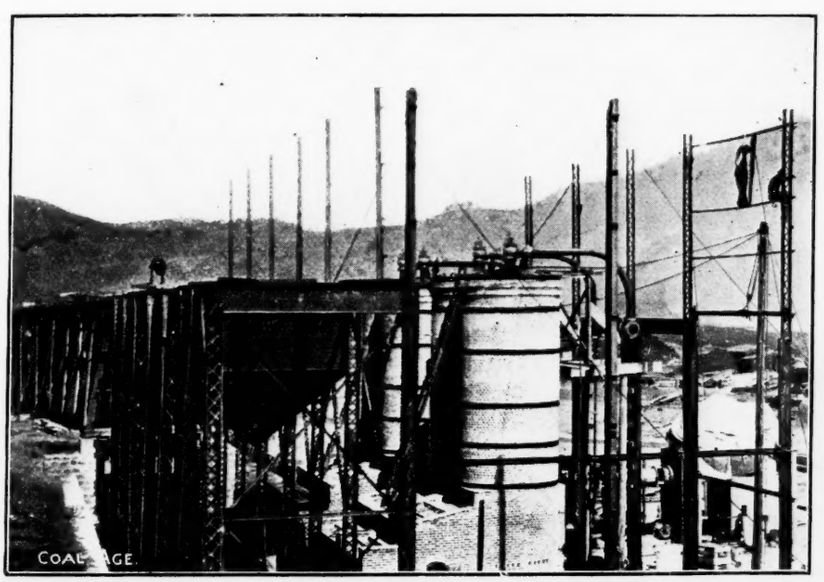
With the intrusion of the Spanish Peaks, a great system of dikes was formed which radiate from the peaks like the spokes of a gigantic wheel. Certain of these dikes may be traced in an easterly direction for many miles. They are usually vertical or very nearly so and their effect upon the coal is extremely varied. In most cases, aside from the expense of cutting through the dikes and the possible change necessitated in the plan of room or entry driving, they cause but little harm; the adjacent coal is not often coked to a serious extent and its bedplane will be found unaltered. Often the quality, hardness, and friability of the coal seam will be altered after passing through the dike.

It also happens that a dike will be encountered of from 100 to 150 ft. in thickness with something like an equal amount of coked coal on either side. This necessitates driving about 400 ft. of dead entry which on account of the extreme hardness of a great portion, especially the core of the dike, will cost the operator sometimes as much as $20 per running foot.

An instance is on record in the district where two seams of coal both reached a dike and passed through it, the quality of each being reversed upon reaching the further side. While this instance is not the rule it is not an extreme occurrance, and the operator who happens to be working a good seam is always far from pleased when an entry encounters a dike.

Perhaps the most serious intruder in the coal seam is the sill, a great system of which originated with the dikes in connection with the intrusion of the stocks of Fishers and the Spanish peaks. These lie nearly parallel to the plane of the coal seam, are composed of very hard igneous rock and while usually of a thickness of only one to three feet, are often of great extent. The adjacent coal is coked and large areas are made unworkable.

In the immediate neighborhood of Fishers Peak, the result of considerable volcanic action is noticible. A number of dikes and faults are encountered and in the case of one upthrow, in particular, the coal seam is displaced 110 ft. at its maximum throw. The great lava flows of this region evidently occurred far above the coal measures, but nevertheless had a marked effect upon them, although probably to a much less degree than in the immediate vicinity of the Spanish Peaks.



Bins, Boilers and No. 1 Turbo-generator at Hastings Power Plant

The Coal Horizons

Along the eastern out crop the coal seams pitch in a direction slightly south of west with an inclination of from 2 to 18 per cent. The mines here are, with two exceptions, slope and drift openings. In the valley of the Purgatoire, the measures lie nearly horizontal —and operations are carried on by drifts. Along the western boundary of the deposit the measures are turned up on edge and a pitch of from 45° to 90° is the rule rather than the exception. As the last mentioned portioned of the field contains no commercial mines the character and pitch of the measures have been determined only by preliminary surveys and small prospects.

The workable coal is found in three principal zones or measures, of which the lowest is the greatest in extent and has been the most thoroughly covered with mines and prospects. It extends above the Trinidad sandstone through a distance of approximately 250 ft. Above this measure is found a barren zone of between 125 and 325 ft. in thickness, containing no known workable beds in that portion of the district where mining has been carried on. The exact extent of this barren zone is a fact yet to be determined.

The middle measures occur next and they comprise a zone of about 200 ft. in thickness. Between the middle and upper measures a second barren zone is found which has a thickness varying from 140 to 340 ft. A number of very thin coal seams occur in this so-called barren strip, but so far as known there is no seam of sufficient thickness or good quality to be workable.

Probably less is known of the upper measure than of either of the lower. These veins outcrop still further back in the canons and are therefore more expensive to open up on account of their greater distance from the main lines of the railroads. The lower and middle measures consequently have been prospected to a much greater extent and much more is known of them.

From an economical standpoint the lower measures are by far more important, there being 32 operating mines in this formation. The minimum thickness of the seams in these measures is 3 ft. 6 in., or from 3 ft. to 5 ft. The maximum thickness of any seams yet opened, is from 5 ft. to 7 or 9 ft. while in one instance a seam has been found having a thickness at one point of 15 ft. These seams all occur at a minimum distance of between 5 and 25 ft. above the sandstone, and a maximum of between 250 or 300 feet.

In the middle measures there are only five operating companies, and the seams have a thickness of between 3 ft. 7 in. and 6 ft. 6 in.; these seams all occur between 400 or 450 ft. up to 550 or 600 ft. above the sandstone. The upper measures also have five operating mines, and the seams here vary from 4 or 5 ft. thick up to 6 or 8 ft. The upper measures occur between 740 or 790 ft., and 900 ft. above the sandstone.

Roof Conditions

The great majority of the coal seams in the district have a shale top or bottom and often both. This may vary in thickness from a few inches to many feet. When thin, the shale is usually overlaid with sandstone or in some cases with another seam of coal. A few mines are fortunate in having a hard slate or sandstone top.

As most of the shale softens rapidly upon coming in contact with the air, the proposition of timbering assumes great importance. The report of the State Inspector of coal mines of Colorado for 1909-1910 shows that, excluding the men killed by mine explosions, the total number of men killed, during 1910, in Las Animas County due to accidents was 52 out of which number 81 per cent. were killed by falls of the roof. This high percentage can be accounted for by the fact that many of the miners can not be made to understand the importance of keeping their places timbered.

The operators furnish plenty of timbers delivered at the miners places underground and the inspectors watch the timbering and do their utmost to get the men to provide for their own safety. When an accident occurs it is usually possible to trace the fault to the carelessness of the injured man or his partner. The lesson to be learned is that too much care cannot be given to the matter of timbering.

As few seams measuring less than 4 ft. 6 in. are operated, comparatively little brushing is necessary. The top is usually taken down, unless on account of a rolling condition of the seam, the haulage grade can be improved by taking up the bottom.

Analyses of Typical Coals

Generally speaking, the analyses of the Trinidad coals show the following: The volatiles decrease from 35.1 per cent. in the northern to 25.8 in the extreme southern part. The ash increases from a mimimum of 6.06 per cent. in the north to a maximum of 20.44 in the south of the district. Fixed carbon follows no particular rule but varies from 48.1 to 58.8 per cent.

The following table gives the average analyses of three typical coals found in this field:

ANALYSES OF COLORADO COALS

	A	B	C
Fixed carbon...	56.4	51.2	55.6
Volatile matter.	35.1	34.0	30.4
Ash	6.1	11.6	11.7
Moisture	2.4	3.2	2.3
B.t.u. 13,554.0		12,821.0	11,389.0

Sample *A* is one of the typical non-coking coals found in the northern part of the district.

Sample *B* is a coking coal from the eastern part of the field.

Sample *C* is from the southern part of the district and is one of the best coking coals found.

The foregoing may be taken as a fair representation of the coal analyses of the district. A trace of sulphur is found in all the coals, the highest percentage being 0.98 per cent. and the lowest 0.35. The highest B.t.u. value of any coal in the district is 13,981 and the lowest 11,389, both of these being coking coals. These figures were obtained from analyses made by F. M. Stanton, of the United States Geological Survey.

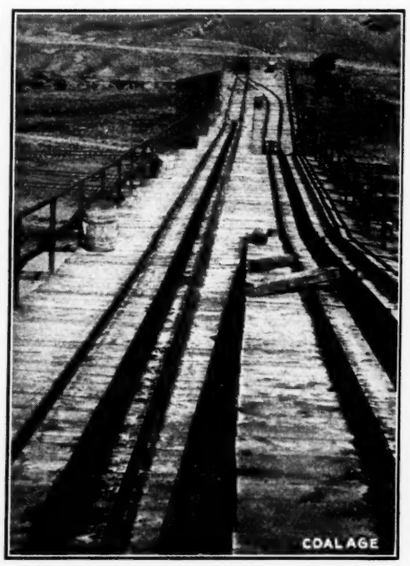
Power Plants

Until a few years ago, each mine operated its own power plant, but lately the tendency has been to combine the small units into large central stations. That is to say, when one company operates two or more mines separated from one another by but a few miles, a site is selected where fuel supply, quality and quantity of water together with simplicity and cheapness of ash disposal are best obtained, and a plant designed upon modern lines is installed.

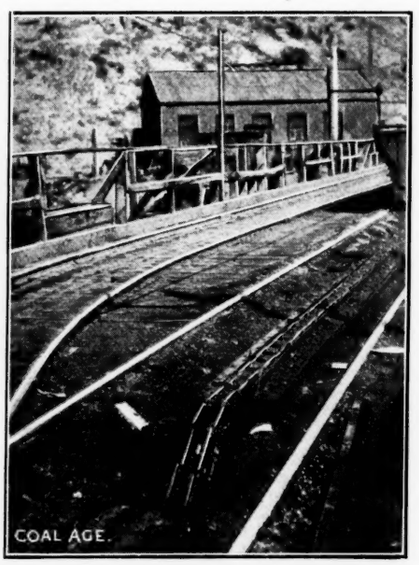
The city of Trinidad has, for several years, boasted of a central power plant, which supplied light and power for the city, its local and interurban street car service, besides a number of coal properties in the district. The distributing power lines now extend as far north as Walsenburg.

The Victor-American Fuel Co. is erecting a new central plant at the town of Hastings, one of the largest producing mines, and by its use, expects to combine economy with efficient service. The equipment of this plant is patterned on the most modern lines.

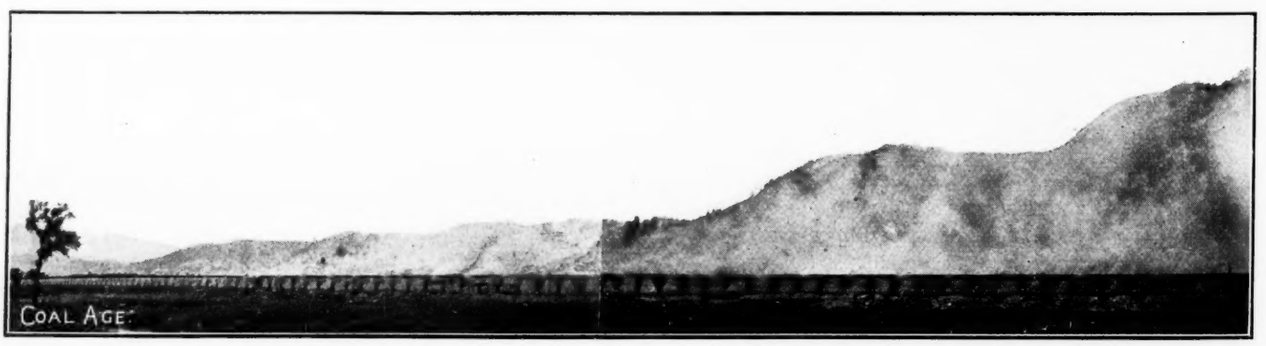
The slack will be dumped from hopper-bottom railroad cars directly into steel storage bunkers, which will in turn spout the fuel into the receiving hoppers of Illinois's chain-grate stokers. The ashes will be taken from the building in buckets of a Trenton Aerial Tramway. General Electric Turbo-generators, La



Car Haul on the Cass Tipple



Feeder on Delagua Tipple



View of a Portion of the South Battery of 600 Beehive Ovens at Tercio

Blanc Condensers, Cochran waterheaters and Stocker Cooling-Towers are included in the equipment of the plant. The buildings are entirely of concrete and steel and the plant will ultimately distribute 1500 kw. Particular mention of this plant is made, as it is one of the first of its kind to be projected by a fuel company.

The general pratice underground is to use direct current haulage and machine motors, the usual potential being 250 volts, although a number of mines are equiped with 500. The lower voltage is to be preferred on account of the saftey to men and mules. But little compressed air is used as a motive power, as the operators have found that electricity is cheaper, more easily installed and taken down, besides being more efficient. All mining machines, punchers, haulage motors, pumps, etc. are now equipped with some form of motor drive.

Above the ground, alternating current is daily becoming more popular wherever the nature of the equipment will permit its use. There is now so much alternating current circulating in the field that it is a simple matter for the operator to install an equipment which will operate with great efficiency and require little repairs. The usual voltages in service are; for long distances 23,000 and 6600; for the various units about the mines 440 and for lighting 220 and 110 with a frequency of 30 or 60 cycles.

Ventilating Equipments

Of the principal mines in the field, seven are ventilated by furnace, four by natural draught, 29 by ventilating fans and two by both fan and furnace. All the larger mines are fan ventilated, the other modes being confined to the smaller and more undeveloped properties.

A great many makes and types of fans are represented. In the majority will be found the Capell, Clifford, Crawford & McCrimmon, Jeffrey and Stein. The Sturtevant and American Blower Co. are rapidly getting into the field.

The Colorado Fuel & Iron Co. has for some time been manufacturing its own fans, at the Pueblo Steel Works and is said to be obtaining some flattering results in such tests as have been made. An American Blower Co.'s Sirocco type fan has recently been installed in one of the largest mines of the Victor-American Fuel Co. with gratifying results.

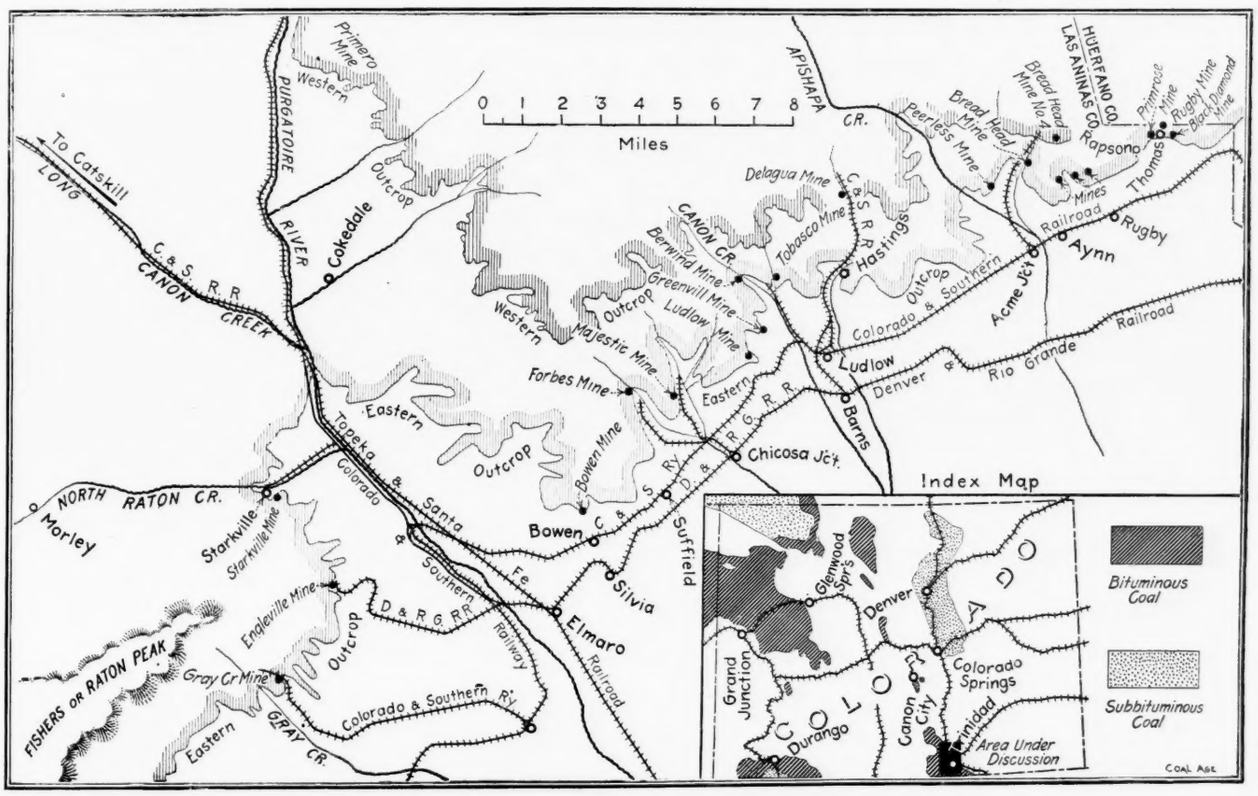
Both the force and exhaust fan is in use, the selection usually depending upon the character and arrangement of the airways and haulage entries. The practice in installing all new fans is to make them reversible although many of the old fans still operated are designed for one direction only.

Haulage Systems

On account of the great percentage of slope and drift mines, rope haulage, in its various forms is generally used. The most popular systems are the endless, the main and tail rope and the single rope gravity for the delivery of coal from the main partings to the tipple. Where grade conditions are favorable, electric haulage motors of from six to twenty tons weight deliver the coal from the mine directly to the tipple.

From the main partings the coal is brought to the tipple in a great variety of ways. At Cokedale, a powerful chain car-haul draws the cars up a steep incline to the dump. At the Cass mine, a similar chain lowers them from a parting located near the pit mouth to the tipple and a second chain-haul returns the empties to the top of the incline from which point an electric haulage motor takes them into the mine, At Wootton, the loads are taken up the grade to the dump by a cabin car-haul and the empties returned by the same means. At Delagua, electric haulage locomotives land the trips upon the car-haul at one tipple while a gravity rope performs the same operation at the other.

At Bowen, haulage motors land the loaded trips at the top of a self-acting plane, whose average grade is 55 per cent. From the bottom of the plane a second motor draws the loads to the tipple. There are many other systems which space will not permit one to mention.



MAP OF THE TRINIDAD COAL FIELD IN SOUTHERN COLORADO

The Problem of Mine Timbering

By R. B. Woodworth*

The several forms of construction that are in common use for supporting mine openings and excavations, are discussed with regard to the character and magnitude of the stresses that they have to resist. The second of a series of articles on mine timbering with special reference to the use of steel.

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Note—Paper read before the Kentucky Mining Institute, Lexington, Ky., Dec. 11, 1911.

Having reached the conclusion that the practice of timbering coal-mine excavations will necessarily be continued for some time to come, the question next arises what kind of timbering should be used in order to accomplish the most satisfactory results from the standpoint of scientific conservation of our resources by their right use. The consideration of this further question presents three main sides:

1. The technical side, which deals with the loads to be sustained in each type of mine timbering, their character and reactions, and the stresses they produce.

2. The physical side, which has to do with the materials of construction and their fitness for use in the various forms of mine timbering.

3. The economic side, which has to do with the costs of the materials, the relative value of the various forms in which they can be employed, and the question of whether, after all, the use of any particular material or any particular form of that material means ultimate economy in expenditure and the lowest possible maintenance charges. Ultimate economy in this connection must needs involve the humanitarian aspects of mining, the preservation of life as well as that of property—life insurance as well as fire insurance.

A full and careful consideration of all these phases is necessary in order to secure that greatly desired end, namely: the reduction of the cost of production to the lowest possible amount.

STEEL TIMBERING IN GANGWAY, MAXWELL COLLIERY, WILKES-BARRE, PENN.

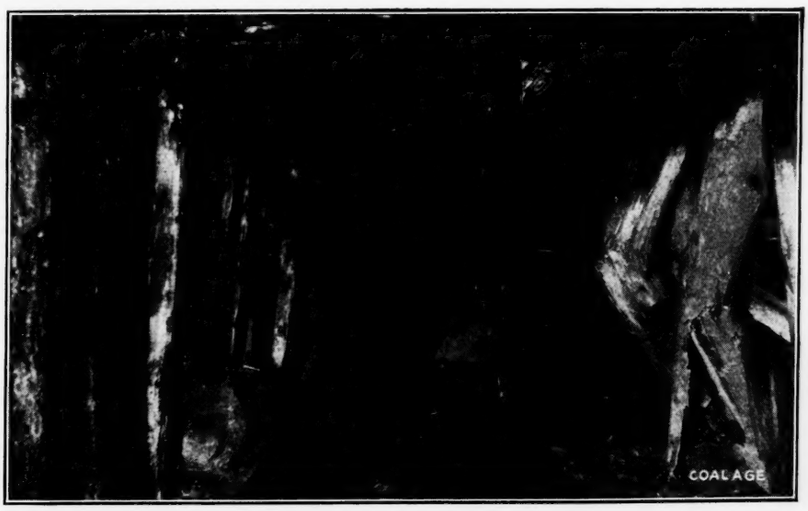
TECHNICAL ASPECTS OF MINE TIMBERING

The prevention of economic waste requires that the accepted practice in mine timbering be based upon correct principles of engineering design, which, in turn, requires accurate information as to the loads to be carried and the stresses induced thereby. This accurate information is not easy to obtain. There are no well defined rules by which may be calculated the load on a square mine-timber set, the compressive stress in a circular shaft lining or even the cross bending moment in a shaft compartment divider. Wooden mine timbers are installed largely on the basis of previous experience in their actual use either in the particular mine in which they are used or in some other mine subject to similar conditions. Even in the case of vertical shafts through undisturbed horizontal strata, the pressures to be sustained are dependent upon sinking conditions, a shaft through wet ground needing more material in its lining than one in the dry.

While the magnitudes of the stresses met with in mine timbering are problematical and do not admit of precise mathematical computation, their character and in consequence the proper form of sections to withstand them, can be understood from a study of the behavior under loading of the materials heretofore and at present used in underground construction. When, for example, a squeeze passes over a gangway timbered in the

usual manner, the effect of its action is seen in the crushing-in of the collar by downward deflection and the breaking-off of the legs by bending in from each side towards the center line of the heading. The same thing occurs in an iron mine operated by the caving system, the tendency being always for the legs to break or shear off at about one-third their height, the pieces always falling toward the center of the excavation, while the collars fail either by breaking at the middle or by shearing at the ends.

In general, from the standpoint of engineering design, it does not make much difference whether the excavation is vertical or horizontal. The same general principles as to the character of the loading and the distribution of stresses apply in both cases. It is an interesting fact that the use of cast iron segments for lining subaqueous tunnels takes its rise from a previous use of identically the same thing in lining circular shafts. We may, therefore, argue with a high degree of certitude that what is true for the framing of a vertical shaft will also apply, in the main, to the framing of a tunnel or heading.



BROKEN TIMBERS IN MINE AT IRONWOOD, MICH.

With these premises we may now proceed to examine into the various ordinary types of mine timber with a view to deciding what material is best fitted to replace wood wherever it is found.

CIRCULAR SHAFTS

The circular shaft lined with brick or cast iron segments is extremely common in England and Europe. All the fourteen shafts described by Meyer in his book on "Mining Methods in Europe" are circular except one, and that is elliptical. All the 150 shafts listed by J. Riemer in his book entitled "Shaft Sinking Under Difficult Conditions" are circular, except five. The circular shaft is hardly known in the United States. There is one in Grundy County, Illinois, and one in the iron region of Minnesota, but these two are all that I know of; and beyond doubt the usual shaft in the United States is rectangular. The advantages of the circular shaft (Redmayne, Modern Practice in Mining, Vol. 2) are: (1) Decreased cost of sinking due to the elimination of corners. (2) Smaller cost for lining. A rectangular shaft costs, in England, approximately $11.25 per ft. for timber lining whereas a circular shaft costs $6.00 per ft., when lined with brick at $5.00 per M. (3) Less difficulty in shutting off water than in a square shaft. (4) Uniformity of stress as regards position. The greatest width of a rectagular shaft should be across the cleat of the stone, so that the long side may be in the position most easily supported. (5) Decreased danger and expense as compared with a rectangular shaft, when passing through a fault. (6) Greater durability of cast iron and brick lining in the circular shaft as compared to the wood lining of a rectangular shaft.

These advantages are due, in an ultimate analysis, to the mining conditions and to the geological characteristics of the strata through which the shafts are sunk and also to the materials used in their construction. In certain parts of England and in certain regions on the European Continent the upper strata are of recent geological formation, and the shafts are sunk in the valleys, while the seams of coal outcrop on the hills, sometimes many miles away. The result of this topographic configuration is to permit enormous quantities of water to percolate into and form reservoirs in the strata above the coal. As the shafts penetrate these strata, the pressures on the shaft lining increase approximately in the same ratio as the hydrostatic head. If under such conditions the shaft is made watertight, the shaft lining is in effect a tube loaded with a water pressure increasing in a constant ratio with downward progress, and, therefore, the thickness of the material of which it is composed may be determined by the rules that apply to hollow tubes. Of course, local conditions also may need to be taken into account, such as the inclination of the strata, the presence of faults and therewith the possibility of unequal rock pressures due to movement in the shaft wall, but in general, the tube formulas apply.

RECTANGULAR SHAFTS

In the United States the coal-mine shafts are either not of any great depth, or where they are deep, almost always pass through strata of the Carboniferous Age. These strata are approximately horizontal in the bituminous coal regions or steeply inclined in the anthracite regions, in both cases extremely hard, free from faults and relatively free from water. The lining need not be watertight and is not, therefore, subject to hydrostatic pressure except in its upper sections. This condition, together with the relative cheapness of wood as compared with brick, etc., has made the rectangular shaft the standard practice in the United States, so that most shafts here are framed with wooden shaft sets and lagged with wooden sheathing.

The stresses to which rectangular shaft framing may be subjected, vary greatly with the character of the material through which the shaft passes. They may also vary with the verticality of the shaft, the members of an inclined shaft being subject to stresses different in character from those in the members of a vertical shaft. Shaft sets are as a rule placed normal to the axis of the shaft, and in a vertical shaft through solid ground and horizontal strata, the load to be borne will not be much greater than the weight of the lining.

The wall plates in such a shaft will, in general, be subject to bending stresses combined with direct compression, the loads inducing the bending stresses being applied transversely and the loads inducing direct compression being the end reactions from the next adjacent wall plates. The buntons or compartment dividers will take direct compression only, except for such small bending stresses as may be induced by their own weight or the weight of guides, ladders, pipes, etc. Where, however, a vertical shaft passes through inclined strata or an inclined shaft passes through horizontal or inclined strata, the buntons or compartment dividers may have to take, in addition to direct compression, bending stresses of large moment due to movement in the strata, while there will be

no sensible change in the character of the stresses in the wall plates. In a vertical shaft, the stuttles or hanging rods will take direct compression or direct tension only. In an inclined shaft they may be called upon to take, in addition, small amounts of cross bending stresses. We have thus in rectangular sets as ordinarily framed, all the varieties of stresses: tension, compression, cross bending and shear.

Elliptical Shafts

Rectangular cages are in almost universal use and the rectangular shaft, which is best adapted for framing in wood, offers also the largest useful area for a minimum amount of excavation. On the other hand, for the same area, useful or otherwise, the perimeter of the circular shaft is less than that of the rectangular. Given fixed sizes of cages, and ladder and pipe spaces, the useless area in a circular shaft may run from 25 to 45 % of the whole, and just that much additional expense for excavation, lining and maintenance must be offset by the cheapness of lining material and construction in order to make the circular shaft economical as compared with the rectangular form. The circular shaft has an advantage over the rectangular in that it offers less rubbing surface, and hence less friction to the air currents. The mining laws, however, usually require separate air shafts and this consideration is of little practical importance for main hoistways.

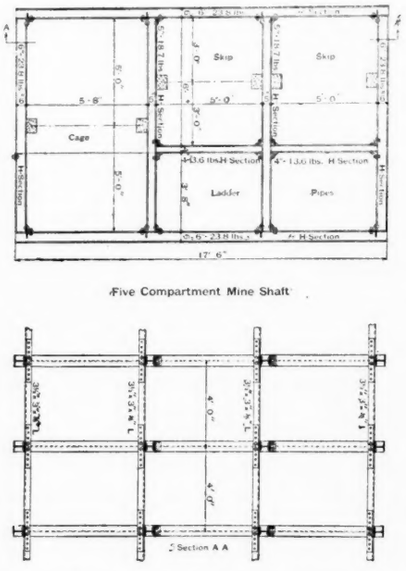
The elliptical shaft represents an endeavor to combine the uniform strength of the circular shaft with the space economy of the rectangular. It has not met with favor in England owing to the difficulties of keeping it plumb while sinking and the obstacles presented to the effective use of the standard walling or tubbing, the various sections of which must be special in the elliptical shaft while in the circular form they are alike and interchangeable.

There is some elimination of useless space in the elliptical shaft, so this type comes between the circular and the rectangular in regard to the availability of space for mine uses. The elliptical shaft also takes advantage of arch action in the lining construction, which may, therefore, be of less thickness than if the shaft were rectangular. Where, however, the shaft is long and narrow, either the rise of the arch must be greater than desirable or else the lining must be made proportionately thick, with the danger of possibly giving rise to excessive shearing stresses between sections of different curvatures. The use of elliptical shafts in the United States is largely due to the employment of concrete as a lining material.

In rectangular shafts, the lining is simply a thin sheathing and serves only to hold the shaft from local fracture and to transmit local pressures to the frames which take all the important stresses. In circular and elliptical shafts the lining itself takes the stresses and, as ordinarily sunk, must be of constant or progressively increasing thickness throughout. The stresses in buntons and compartment dividers are similar in character regardless of the type of shaft.

Three-Piece Gangway Set

The three-piece mine timber set, composed of a collar and two legs, is the standard framing in coal mines for tunnel excavations and other level headings. Where the strata are horizontal and quiescent, the collar takes cross bending



Five Compartment Mine Shaft

Steel Framing for Five-compartment Shaft

stresses only and the legs pure compression. Failure takes place by the vertical deflection of the collar under stress beyond the elastic limit of the material or by the cross breaking of the legs under shear induced by undue compression. Where the strata are inclined and in motion, the collar may also have to take compression and the legs cross bending stress. In swelling ground, conditions are much the same except that instead of the sides of the excavation coming in, the bottom comes up or the top comes down, thus again throwing a bending stress into the legs. In case of failure, it is probable the pieces will fall towards the outside of the heading rather than towards the center. The character of the failure may be changed and its inception prevented, in a measure at least, by the use of mud sills under each set, which are always desirable in ground of this character.

Gangway sets in wood are usually made with all three pieces of the same diameter or width and depth. While in many instances this practice is wasteful, there are two reasons for it; first, the simplicity of the framing, and second, the low shearing value of wood and the possibility that under stress the full shear area may be required. As wooden mine-timber failures take place so largely by shearing, it would seem that after all, the practice may be in good accord with the best principles of structural design.

I have had occasion to coin the term "steel mine timbers" to cover the three-piece gangway set when framed in steel, and I use the term "roof support" to designate a single beam supported at its ends on the side walls and in turn supporting the roof. While the object of all mine timbering is to support the roof or hanging wall, the distinction between the framed set and the single piece has proven convenient. While it is conceivable in rare instances that they may have to resist compression, roof supports as a rule, whether of wood, steel or concrete, take cross bending stresses only, except at the ends, where they are subject to shear. They must, therefore, be figured by the formulas for flexure.

The Occurrence of Marsh Gas

By W. Hartman*

While marsh gas is occasionally found in the adjoining strata, it belongs essentially to the coal seams proper. Its distribution in the coal is often quite irregular. While not a positive rule, it is usually the case that the less cover over the coal, the smaller the quantities of gas found, since the light cover permits the gas to more readily escape.

As a result of a systematic comparison of a number of different coals, it has been found that those carrying from 20 to 25 per cent. volatile matter are as a rule the most gaseous. From coals of this volatile content, the gas proportion gradually decreases until it reaches its minimum in anthracite. This rule, however, should not be taken as infallible, for exceptions to it are not infrequent.

Thus, for example, a horizontal seam will often carry gas at one point and show no indications of it at others; and an outcropping seam seldom shows any gas near the crop but may have large quantities at greater depths. Probably one of the greatest influences on the gas contents of a fairly gaseous seam is the permeability of the strata that overlies the coal.

*143 Liberty St., New York.

Use of Grout in Shaft Sinking

By R. C. Johnson*

One of the chief difficulties of shaft sinking lies in dealing with the water that is frequently encountered. Forcing cement grout into the fissures of water-bearing strata by means of compressed air is a new and effectual solution of this problem. The advantages of obtaining dry shafts are apparent to mine operators and include a great saving in the usual cost of pumping.

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Without doubt the most important step that has been taken in connection with sinking shafts in this country during recent years, is the introduction of the process for cementing water-bearing seams encountered in the sinking. Although the process has been used in a rather similar form in Germany, no reports show that its practice has extended to the grouting of comparatively small water-bearing fissures, with the idea of making practically dry shafts. In general it has been used there only when huge flows have been encountered and exceptionally great expense for pumping has been forced on the operator.

The process as actually used here, is one of forcing Portland cement grout into holes drilled in the bottom of the shaft, the cement and water being mixed in an air-stirred grout tank which is connected directly to the compressed-air supply on one side and to the hole to be grouted on the other. In view of the wonderful possibilities that the process offers for saving money, a brief description of the method as it would be used in the sinking of mine shafts should be of interest to those who have shafts to sink or to those who for years have been pumping water from the bottoms of wet shafts. To the latter, the advantages of the process will probably appeal most strongly.

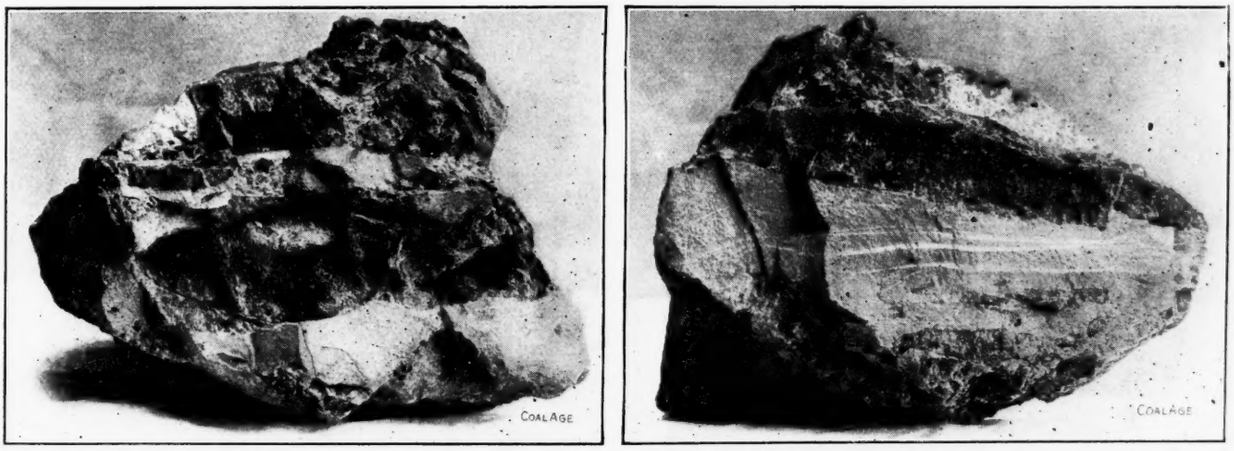


FIG. 1. SAMPLES OF ROCK SHOWING CREVICES FILLED WITH CEMENT GROUT

DESCRIPTION OF METHODS

Sinking is started in the usual manner. As soon as the drills "cut" water, preparations are made for grouting. The air line which is used for drilling is run close to the bottom of the shaft for connection to the grout tank. The drilling is continued until the longest length of steel used is run into the holes. Then the drills are taken out of the shaft and a small specially shaped pipe nipple, wrapped about its enlarged portion with flannel or burlap, is driven tightly into one of the holes.

To this nipple is connected a piece of high pressure hose that leads to the grout tank on the floor of the shaft. This tank is made of boiler plate, has about 4 cu.ft. capacity and is similar in shape to an upright air receiver on legs. As shown in Fig. 2, there are pipe connections for air at the top and bottom and a connection for the discharge of the grout. The sand, cement and water, which are admitted through a small opening at the top, are mixed into a grout by the stirring and bubbling effect of compressed air admitted at low pressure through the bottom inlet pipe. The only construction in the tank that aids the air in mixing the grout, is a steel grating placed midway between the top and bottom air connections.

At the bottom of the tank and opposite to the lower air connection is the pipe way for leading the grout to the drilled holes. The general arrangement is as shown in Fig. 3, certain additional blow-off pipes and connections for pressure gages being installed for cleaning and for testing purposes. Just before the grouting is started, the drill hole is cleaned by pumping, if it is merely a running hole; if the hole is a spouter it will practically clean itself.

FORCING IN THE GROUT

The pipes are then connected to the nipple in the hole, the batch is put into the tank and air at low pressure is admitted through the bottom connection, for stirring purposes. Next, the tank door and all plug cocks are closed except one which admits air for running up the pressure in the tank to the desired mark. The plug cocks in the discharge line are then opened and the grout forced into the hole and into all the crevices leading to the hole. The holes are grouted to refusal, that is, until the gage shows by the rise of pressure that all crevices connecting with the hole are filled. The plug cock nearest the tank is then opened and the charge wasted. The other plug cock, immediately above the hole, is next closed, the grout hose disconnected from above the valve and the tank and pipes cleaned by blowing out.

The apparatus is then connected to another hole. If the grout from the first hole is seen bubbling up in other holes, they are immediately plugged. Such bubbling shows, of course, that fissures are connecting the several holes. The one grouting connection will in this case serve for all the holes in which the grout is seen. If the grout is seen to rise through crevices in the floor of the shaft, a different method of procedure is required. It is necessary to place over the

floor of the shaft a reinforced concrete mattress which is allowed to set for a couple of days. Holes are then drilled through this mattress, just as if it were a shaft bottom, and the grouting process continued as before.

At first, the drill holes are spaced over the shaft bottom just as they are spaced for shooting and the grout tank is connected to every hole that shows water. The grout is allowed to set for about 8 hours and after this, test holes, deeper than the regular round, are placed along the rib. If these show water, they are grouted and additional test holes are drilled until no water rises from the rock. The shaft is then again drilled for shooting, the number of side holes being increased so as to cut the rib as clean as possible and keep the grouted seams solid. In the regular process of sinking the shaft, the sump is then fired and mucked. The grout will appear in the crevices it has filled, like a white fine-grained sand stone. In one instance, a section of a gneiss rib, so treated, appeared as a prominently white-streaked dark marble. The benches are then fired and sinking resumed in the usual manner until more water is "cut," when the process is repeated.

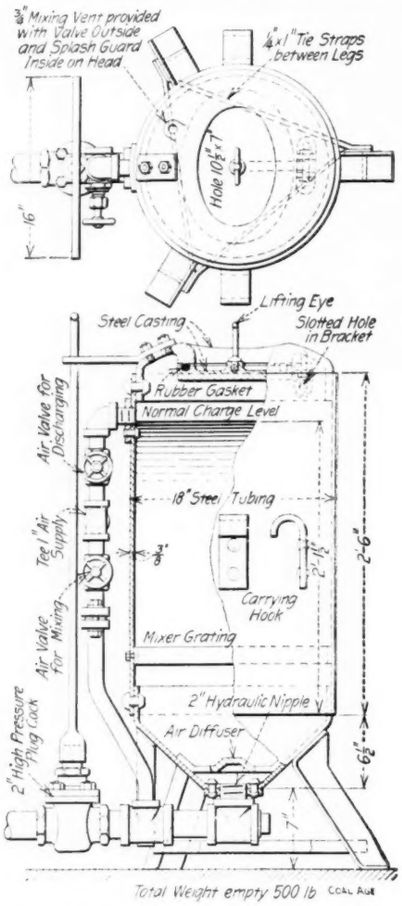


FIG. 2. GROUT MIXING TANK AND CONNECTIONS

PRESSURES REQUIRED FOR GROUTING

The pressure required to grout a hole is dependent on the pressure of the water coming from the hole because the grout must take the place of the water. Theoretically the application of this process is limited only by the pressure that the air compressor can develop and the air connections can withstand. The height that the water reaches as it spouts from the drilled hole is an accurate indicator of the least air pressure that will be required but the pressure actually used will be often much greater than indicated by this head, in order that the most minute crevices may be plugged.

However, when using high pressure every precaution must be taken against blowing out the nipples and breaking the connections. In one case, described later, it was actually necessary to drill the rock and insert wedge bolts to chain down the pipe connections to the holes. The water and sand spouted from these holes with such force that a 2" plank, placed over the hole to deflect the water, was in one case completely bored through in about two minutes. While drilling one of these holes, a 10-ft. steel dropped down the bore when it struck a stratum of sandy disintegrated gneiss that was later found to be producing the water. In a few minutes the steel was seen to shoot out of the hole and some distance up the shaft with a stream of sand and water behind it.

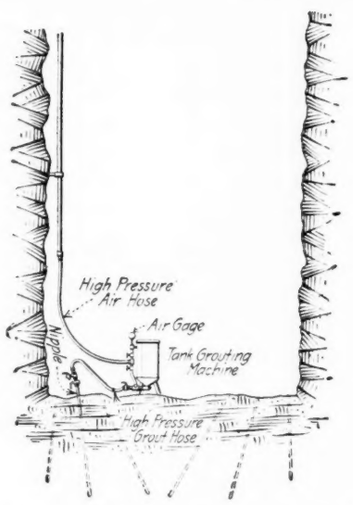


FIG. 3. SHAFT BOTTOM, SHOWING ARRANGEMENT OF GROUTING DEVICE

RECENT GROUTING OPERATIONS

In sinking the No. 4 shaft of the city tunnel for the Catskill Aqueduct in New York, a stream of water was encountered at a depth of 149 ft. As soon as the drills struck the water the contractor decided to attempt to cut off the flow by plugging the crevices with cement grout. Anyone familiar with shaft sinking knows of the many difficulties of pumping, and in round shafts such as are the large majority on this Aqueduct, the troubles are more than doubled because of the general practice of drilling the entire round on one shift. The handling of a pump at the bottom of a round shaft for only 30 gal. of water per min. means a loss of at least 5 ft. of sinking per week. It was of advantage then, both to the city which paid for the pumping and to the contractor as an aid to his speed that the water bearing fissures should be grouted if possible. Accordingly a grout machine of the Caniff patent type was procured and taken down the shaft for connection to the holes showing water. Only two days were lost in completely sealing off the flow and the sinking was resumed.

However, on Oct. 28, at a depth of 183 ft., the drills "cut" a stream of such high pressure that while there was no loss of time in deciding what methods to pursue, there was, and still is, considerable speculation as to its cause. A gage placed on one of the drill holes registered 65 lb. and it required but a moment to figure that the water was coming from near the rock surface. The shaft is situated within 100 ft. of the Jerome Park reservoir and within a few hundred feet of the Croton Aqueduct. Shooting into the water under such pressure seemed suicide and as later developed, the shaft would probably have been "drowned out" had it been attempted.

It was decided to provide a high pressure grout machine with high pressure fittings. As previously noted it is essential that the grout be forced into even the finest crevices, and when it is known that over 300 lb. pressure was used on some of the holes—335 lb. on one of

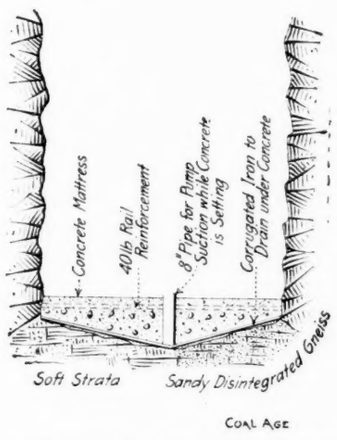


FIG. 4. CONCRETE MATTRESS AT BOTTOM OF SHAFT

them—the effectiveness of the work can be appreciated. Nevertheless test hole after test hole was drilled and still the water persisted in appearing. Finally a complete ring of holes was drilled around the periphery of the shaft, the holes being kept close together. These were grouted and the cut and side holes fired. The water pressure had decreased considerably but a new condition appeared.

A Concrete Mattress Used

The bottom of the sump was soft and sandy and soon proved to be badly disintegrated gneiss, an unusual occurrence, surrounded as it was by the hardest kind of material. Attempts to grout off the water in this sandy structure failed at first because the grout would bubble to the surface and allow but little pressure to be put into the holes. It was finally found necessary to cover the whole shaft bottom with a reinforced

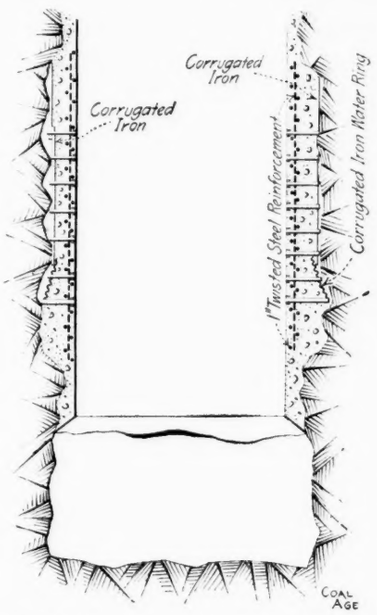


Fig. 5. Reinforced-concrete Shaft Lining

concrete mattress as shown in Fig. 4. The concrete was placed on corrugated iron to allow drainage to an 8 in. pipe that was stood upright in the center of the shaft to carry the pump suction while the concrete was setting. Holes were then drilled through the mattress and down into the rock and attempts made to grout.

The flow was decreased considerably but not entirely. The reason for this became clear when the concrete was removed and the rock shot up. Pieces of the grout, shaped precisely like a diamond drill core, were found in the muck with clumps of cemented sand clinging to them. Clean, or even fairly clean, crevices were grouted perfectly but strata of sand were only matted in spots and it was from these strata that the remaining water was coming. Sinking was then continued for about 20 ft. and the regular concrete lining of the shaft was started.

The shaft was enlarged through the soft sandy strata so as to permit ample drainage channels behind a heavier-than-usual reinforced concrete lining. As reference to Fig. 5 will show, grout pipes were run from the inside face of the lining back to these drainage channels. These pipes carried the water through the lining into the shaft and after the concrete had set for a week or so, they were closed with ordinary plugs, thus completely shutting off the entire flow. Later, these plugs were removed and grout forced in behind the lining to fill the drainage channels.

Advantages to the Mine Operator in Obtaining Dry Shafts

The fact that the problem of dealing with the water encountered in sinking a shaft has met with a new and effectual solution, marks a big step forward but by all odds the greatest advantage of the grouting process is the saving of money that the mine owner would otherwise have to spend year after year in pumping the water of a wet shaft. The cost of pumping 200 gal. of water an hour from the bottom of a mine shaft 500 ft. deep is easily figured. This is probably an average quantity for a shaft of that depth and will require about 25 water horsepower. Taking as a basis a direct acting pump using 90 lbs. of steam per horsepower hour it is readily figured that 75 boiler horsepower are required. A horsepower will cost the mine operator about $20.00 per year and $1500.00 per year will be the total expense for pumping the shaft water.

Grouting with cement and sand as the shaft is being sunk will save this expense and under ordinary conditions, crevices that will produce a flow of 200 gal. per hour, can be grouted solid for much less than a year's cost for pumping. With successful grouting, no water rings will be required and so the actual increase of first cost to the mine operator will be small. The idea is new in this country and the method as it has been described here is entirely new to shaft sinking practice. It has proved a success in every instance that it has been tried of late and engineers who have studied the operation pronounce the shaft water problem solved.

In certain English mines, experience has shown that a small quantity of soap dissolved in mine-sprinkling water adds to its effectiveness as a dust layer, as the soap tends to coagulate the dust and hold it down.

Pittston District Mining Institute

Special Correspondence

The annual dinner of the Pittston District Mining Institute was held, this year, in the new State Armory, at Pittston, Penn., Saturday evening, Feb. 17. The banquet was the most successful that has ever been conducted by the Institute. It was attended by 600 of the seven or eight hundred members. W. T. Jennings, superintendent of the South Pittston district, for the Pennsylvania Coal Co., and president of the institute, presided with his usual grace and efficiency. President Jennings introduced, as the toastmaster of the evening, Judge O'Boyle. The judge delivered a well rounded and eloquent address, and told in his own inimitable fashion many amusing stories.

One of the best and most forcible addresses of the evening was made by the Rev. W. T. Blair, of Plymouth, Penn. The reverend gentleman's subject was, "The Man on the Job." The address was full of encouragement and inspiration.

An excellent address was delivered by Samuel J. Jennings, mine inspector, eighth anthracite district, outlining the work and the purposes of the Miners' Institute. Mr. Jennings asked for a greater interest and coöperation on the part of all the members, and hoped in the coming year that they would be able to reach a larger number of the foreign element among the miners, and be able to help them to a better understanding of mining dangers and conditions.

Other District Institutes Send Greetings

The greetings of the Scranton District Mining Institute were presented cordially by Mr. Andrew Bryden, of Scranton. Mr. Charles Enzian, of the Bureau of Mines rescue work, was present, bringing the greetings of the Wilkes-Barre District Institute. Hon. James E. Roderick, chief of the department of mines, Harrisburg, Penn., was to have addressed the meeting, but was unavoidably detained.

The final address of the evening was given by J. T. Beard, associate editor, Coal Age, New York City. Mr. Beard spoke briefly of the peculiar environment of the coal-mining industry at the present time. He referred to the fact that coal, being a necessity of life, its price was limited to what may be called a *living price*. This was stated to be the upper limit, while the *living wage* demanded by the miner was described as the lower limit in the cost of production, in coal mining. Mr. Beard drew the conclusion that the range between these two limits was so narrow as to require a greater efficiency on the part of mine officials and miners alike. This was declared to be the practical solution of the problem.

Rock Dust in Explosions

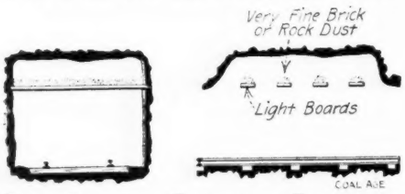
By A. E. Lindrooth*

The many recent disastrous mine explosions have shown one thing conclusively, and that is that could each explosion have been limited to the entry in which it started, the loss of life and damage to the mine would have been small.

There is a need for a simple and reliable method of stopping the progress of the flames propagated by the explosion.

From England comes a hint that is at least worth while trying. The flame of an explosion is doubtless of exceedingly short duration, and if a dead space of 20 or 30 ft. could be provided at each entry, it is probable that most of the explosions would be limited to the entry in which they originate.

The suggestion is to provide a means of instantaneously filling a portion of the entry with a noncombustible powder which will dampen the coal dust and stop the progress of the flames. This is accomplished by taking down about 2 ft. of the roof and resting light boards



Rock Dust for Deadening Explosions

about 10 in. wide, spaced about 22-in. centers, on notches made in the opposing ribs, and covering the boards as thickly as possible with exceedingly fine or impalpable rock dust. The force of an explosion would tend to dislodge this dust in a large volume, thus completely clouding the air and forming an obstacle to the spread of the flames. The scheme is so simple and so easy to try that further experiments should be made to determine its efficiency.

Electrical Shot Firing

By W. Hartman†

The principal disadvantage of electrical shot firing lies in its lack of simplicity, since electric current, wires and special detonators have to be arranged for. For this reason this method is often rather expensive.

As far as the safety of the miner is concerned, electrical firing is much superior to other methods, as it gives the greatest assurance that the shot will go off at a fixed time; thus enabling the miners to go to a safe place and fire the shot at their leisure. It also eliminates the danger incident to going back on a dead shot—a frequent cause of serious accidents. In addition to this, the gaseous condition of the mine need not interfere with the shooting.

In firing all the shots in the entire mine simultaneously, the danger of a dust explosion is also eliminated, or greatly reduced, as conditions at the face remain the same for all shots. On the other hand, when fired with fuse, by the time the last shots are being fired, the mine air is so agitated and filled with flying dust as to be in a highly dangerous condition.

The simultaneous discharge of a number of shots at the same point is also of advantage from an economical standpoint, as, when shooting off the solid, the result of several shots fired at the same instant is nearly double that when fired separately.

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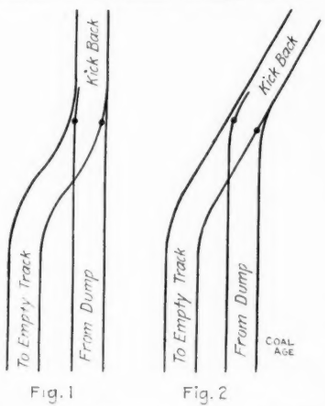
†143 Liberty St., New York.

Cross Over Dumps

By Benedict Shubart*

Where cross-over dumps are used, the ordinary straight track kick-back is a source of constant delay, due to de-



Wrong and Right Way to Install a Kick-back

railed cars, particularly where cars have a short wheel base or are old and rickety.

The usual method of laying the kick-back track is shown in Fig. 1. By laying the track as shown in Fig. 2, the switch is passed while the car is going comparatively slowly. Furthermore, the switch is trailing. When the car returns from the kick-back, it runs on the straight track and is much less liable to derailment. The curves shown on the sketches are exaggerated in order to convey the idea. In fact, the curves should be as long as the limits of the tipple will reasonably permit.

The coal fields of Spain cover an area of 4117 square miles and give employment to 26,932 persons, 1128 of whom are females. Anthracite, bituminous and lignite are included in the production.

*Boston Building, Denver, Colo.

Fifteenth Annual Banquet of the Northeastern Pennsylvania Engineers

Special Correspondence

Nearly 300 men attended the 15th annual banquet of the Engineers' Society of Northeastern Pennsylvania, held at the Hotel Casey, Thursday evening, Feb. 15. The whole affair was both interesting and instructive—interesting, because of the good cuisine service, and the excellent music rendered by a local quartette; instructive, because of several worthy addresses.

The president's address, delivered by A. B. Jessup, mining engineer of the Lehigh Valley Coal Co., was a most excellent talk, one of the very best it has been our pleasure to hear this gentleman deliver. Mr. Jessup particularly boosted the idea of a club house for the members of the society, and it does seem that such a representative body of engineers, largely concentrated in a small area with first-class transportation facilities, should be able to supply themselves with a common meeting place in keeping with the great industry these men represent.

Homer Greene, of Honesdale, Penn., was toastmaster and performed this service in a most creditable manner. Mr. M. W. Alexander, of Lynn, Mass., gave a talk on "The Industrial Value of Engineering Education." Mr. Alexander handled a rather dry subject in such a way as to command the close attention of those present. His experience derived from his sociological work with the General Electric Co. fitted him admirably to present interesting thoughts on present industrial problems.

Mr. Bigelow, state highway commissioner of Pennsylvania, talked to the engineers present about "The Roads of Pennsylvania and What the State Expects to Do with Them." Other addresses were delivered by Judge Newcomb, of Scranton, and Mason D. Pratt, president of the Engineering Societies of Pennsylvania, Harrisburg, Penn. Mr. Pratt advanced the suggestion that it would be a good thing for all the engineering societies of Pennsylvania to unite in a great federation so as to increase their power and thereby enlarge their influence for good.

The points which most impress mining experts visiting foreign coal mines are: In England, the care given to underground details and the perfection of all construction work; in Belgium, the high degree to which hospital and rescue work have been carried; in Germany, the magnificent equipment of the mining plants and power houses, and the fight against ankylostomiasis, carried on by means of sanitary provisions underground and baths for the miners; in France, the completeness of chemical, electrical and laboratory research.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Causes of Gob Fires

The report of W. H. Pickering, of the York and North Midland inspection district of England, gives the following details relative to the danger of explosions resulting from gob fires, and the causes which aid and create the latter: "When stoppings are being erected to shut off a gob fire, there is always serious danger of an explosion in cases where inflammable gases escape from the strata or are distilled by the heat. The danger increases with the extent of open area inclosed. If there are large open spaces beyond the stoppings, the danger of a violent explosion is great; but if the open area inclosed is small, an explosion is unlikely, and if one occurs it will be in the nature of a puff of flame with little force.

The danger is far greater shortly after the air current has been stopped or checked by the building of walls. The spaces within the stopping will be unventilated, and explosive mixtures of gas are likely to accumulate. The air will not be stagnant, for the heat of the fire will produce currents by convection, and these may be the means of carrying the explosive mixture to the fire. If no explosion occurs shortly after the air current is cut off, the danger is usually over, for the supply of oxygen will rapidly diminish and the products of combustion will also make the formation of an explosive mixture impossible. I had the experience of witnessing a very violent and extensive explosion while a colliery fire was being sealed. It occurred about five minutes after the air current was cut off.

Why Gob Fires Occur

The danger of gob fires is greater in the newer pits, for up to the present the fires have been more numerous, and extraordinary quantities of firedamp are found. In some cases petroleum oil drips from the roof, and saturates the timber. This is another element of danger. The gob fires occur for the most part at the edge of the shaft pillars, and in places where ribs or pillars of coal have been left or lost, and where timber has been left in the gob. Fires occasionally occur in the roadways in the coal, and at times in the shale over the seam.

At first sight it might be assumed that the fires in the Yorkshire mines were the result of leaving so large a percentage of coal in the gob. No doubt, this makes fires more serious and dangerous when they occur, but it is by no means certain that it is the primary cause. If it were, then fires could not fail to be more numerous at the pits where coal equal to a seam 4 ft. thick is left to be ground to slack in the gob.

At some of the collieries no fires occur, though their neighbors, working the same seam under what appeared to be the same conditions, have serious trouble. There is some evidence that the fires usually have their origin in breaks in the hard or steam coal, and they seldom occur when the whole of this is extracted. As this is the most valuable part of the seam, it is not left except in cases of shaft pillars, heavy falls, faults, etc.

Practical tests seem to show that this coal is more difficult to ignite than the soft coal, and it is posible that the fires are caused by the fine dust which results from the grinding of the soft top coal during the settlement of the strata. This lodges in the cracks of the hard coal and rapidly absorbs oxygen. This coal also contains iron pyrites, which would generate heat in such circumstances if moisture were present. Timber is far more easily ignited than coal, and that is the reason why it is dangerous to leave it in the goaf; it does not cause the heating, but supplies the tinder.

Periods of Danger

I am indebted to Mr. W. H. Chambers for a list of gob fires at Denaby and Cadeby Main Collieries during the past 30 years. Perhaps there may be some atmospheric reason why so many of them have occurred during the months of November and February. The figures for the months in which gob fires started are: January, 2; February, 8; March, 5; April, 1; May, 6; June, 3; July, 4; August, 6; September, 3; October, 4; November, 10; December, 4—making a total of 56, or nearly two a year. At the two new collieries recently opened in the Doncaster area, 17 cases of spontaneous combustion were reported during the past year."

Conveyors for Use at Coal Face

By H. Ridsdale

Several types of conveyors are being used in England to convey coal from the shoveler to the car. Some are continuous, some discontinuous and reciprocating. They not only increase output but reduce risk from falls of roof.

Note—Abstract of paper read before South Staffordshire and Warwickshire Institute of Mining Engineers, England.

The use of coal-cutters necessarily concentrates longwall workings, and, in order that they may be a commercial success, it is necessary to clear away rapidly the machine-cut coal from the face. This can be done either by an increased number of roads, or by the use of conveyors; and it is because the maintenance of roads—especially in thin seams—is such an expensive item that conveyors have been designed. Nearly all types of conveyors in use at the present day have been specially designed to suit some particular local conditions.

Apart from giving rapid clearance to coal-cutters, conveyors reduce labor and deadwork charges, even when coal-cutters are not employed. These charges are not only reduced by the rapid working of the seam, thus securing an increased output from a given length of face, but also by the consequent reduction in the ripping and deadwork required in the face and roads. The reduction of labor-costs naturally raises the question of the method of payment for labor in connection with conveyors. Various methods have been tried, and perhaps the most successful is the division of the tonnage delivered by the conveyor in proportion to the number of cubic yards worked by each individual man. Other methods have been adopted, such as payment of day wages, but everyone knows the disadvantages of this method; while, in other cases, the conveyor face has been let to a contractor; but, since he is a man without capital, the employer is usually expected to make good his wages in case of a deficit, while in the alternative the contractor reaps the benefit.

Electricity Economical but Compressed Air Safer

Conveyors are usually driven either by electricity or by compressed air; the former method is probably the more economical, while the latter is probably the safer, more particularly if the engine be placed at the delivery end of the conveyor. There a cloud of dust is created, which suggests the necessity for brisk ventilation, and seems to point to the use of compressed air. The position of the motive power for driving conveyors is usually fixed by the makers, but in some instances this is left to the discretion of the user. There are two positions available; the one at the delivery end, where it is under the direct supervision of the filler, and therefore to be preferred; the other at the trailing end, where it renders the tension arrangements simpler.

The Blackett Conveyor

The Blackett conveyor, which consists of an endless chain working in steel troughs supported by an angle-iron frame built up of sections called "gates," which are joined together by short spikes fitting into circular holes. The fact that the chain is made up of links, any one of which can be opened, and as many links as desired inserted, allows of an easy lengthening of the chain or the replacement of a broken link (unless it should happen to be in the bottom chain), and this constitutes one of the chief advantages of the conveyor.

The motive power, speed-reduction gear, sprocket drum and end trough are all mounted on the same bedplate, and

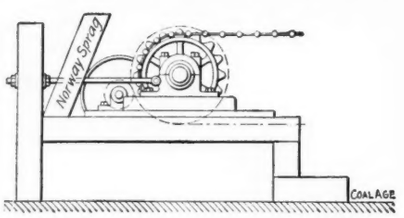


Fig. 1. Tension End, Blackett Conveyor

the whole can be swung across with a Sylvester pulling bar, when moving the conveyor forward. At the tension end of the conveyor the gates are held in position by two sprags placed between the roof and the bedplate, and the chain is tightened by the nut and bolt arrangement shown in fig. 1.

For the proper working of this conveyor, it is absolutely essential that it be laid down in a straight line, and that the floor be even. With an uneven floor, or in case of incorrect alignment, the chain will rise in the troughs. The chain tends to pull straight and in moving round a curve, under heavy load, it rises from the bottom of the troughs, allowing some coal to get underneath and forcing humps over the sides. Slack is also a source of trouble, as the chain will ride on it.

The Sutcliffe Conveyor

The Sutcliffe conveyor is similar in design to the Blackett conveyor, the chain being replaced by an endless canvas or wire-cloth belt 20-in. wide, which runs between two 3 by 3-in. angle irons supported on brackets. These angle irons are made in 9 ft. lengths, and are fixed to the brackets by bolts so as to form a

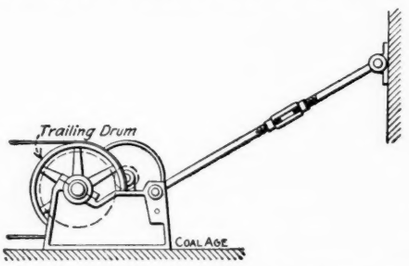


Fig. 2. Tension Arrangement, Sutclifee Conveyor

trough; the brackets are 9½ in. wide at the top and 13½ in. at the bottom, and stand 13½ in. high. Each bracket supports two rollers, one to carry the top and one the bottom belt; intermediate rollers are also placed halfway between the brackets for the top belt to run on, these rollers being fixed to the angle irons. The belt is joined together by riveting copper plates on to each half of it, so forming a dovetail joint like a hinge, through which is passed a steel or copper pin.

It is not desirable to have too many joints on the belt, or to have these too close together, as, being less flexible than the belt itself, they become a source of trouble. The engine, driving gear and first pair of angle irons are in this case mounted on one bedplate. The engine is slightly larger than in the case of the Blackett conveyor and drives the belt by a chain and sprocket wheels, the larger sprocket being attached to the drums round which the conveyor belt passes.

The belt in returning is carried over a roller fixed immediately behind and geared with the drum, so that the belt is in contact with at least two-thirds of the drum surface. The engine is capable of driving a conveyor up to 150 yd. in length. This conveyor is made so that it can be reversed when desired. The tension on the belt is obtained by using a Sylvester pulling bar or chain block the final adjustment being made by a double-threaded screw, as shown in Fig. 2.

The conveyor is moved toward the face in almost precisely the same manner as the Blackett conveyor, and, if the roof will not permit of its being swung bodily across, it must be systematically taken to pieces. It has been found in practice more convenient and better for the working of the conveyor to avoid breaking the same joints each time when moving it. This machine has one advantage over the Blackett conveyor; it will carry slack and small coal without difficulty; on the other hand, water will cause the belt to slip on the drum.

The Ritchie Conveyor

The Ritchie conveyor consists of a canvas-wire belt about 25 yd. long, working to and fro in steel troughs by a main-and-tail haulage arrangement, the main rope being attached to the front end and the tail rope to the back end of the belt. The troughs are made in 6 ft. lengths, 22 in. wide, 8 in. deep on the gob side, and 4 in. deep on the face side, to facilitate the filling of large coal. In order to prevent the belt from catching in the ends of the troughs as it travels backwards and forwards, projecting edges are avoided by specially constructed overlapping curved joints, made as shown in Fig. 3.

The engine (which may be similar to that used on the Blackett conveyor), speed-reduction gear, and main-and-tail drums, are all supported on angle-iron framework, and the whole run on rails in the gate-road, thus rendering all working parts easily accessible. The drums are driven by a chain drive and gearing, and are thrown in and out of gear by means of friction clutches. The first trough, which is fixed to the angle iron framework by four bolts, is placed immediately over the main drum, and projects beyond

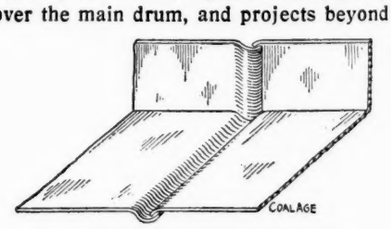


Fig. 3. Trough Joints of Ritchie Conveyor

it, allowing the belt to be wound on the main drum as the coal falls into the car.

This conveyor has the advantage of being easily and rapidly moved, even though it has to be taken to pieces. This type of conveyor is more simple to lengthen than the Blackett, and an undulating floor is not detrimental to its economical working. It has also these further advantages—no tension is required, and it takes an even load in either direction. It has, however, one advantage—it necessitates driving a road sufficiently wide to carry both the engine and the car to be filled. I again find it extremely necessary to insist that this conveyor must work in an absolutely straight line, otherwise the belt will catch in the troughs and buckle up.

The Gibb Conveyor.

The Gibb conveyor, which consists of two end-discharging gears and several intermediate cars, the number of which depends entirely on the length of face and local conditions, is a type of conveyor in which the position of the engine is not necessarily fixed, but the best position for it is at the delivery road. In order that the car may be efficiently filled the buffer skids must project out to about the middle of the road, and this projection is awkward and inconvenient. This conveyor need rarely be taken to pieces when being moved.

A soft and undulating floor is very detrimental to the economical working of this conveyor, and if these conditions prevail trouble is bound to arise. The conveyor must also work in a straight line; it is advisable to keep it a reasonable distance from the timber, as loose coal or rock will at times cause it to turn over and knock out the props. The efficiency of the conveyor depends on its being rapidly filled and emptied; and, consequently, if the coal requires much manual labor to get, the work is better concentrated on a length of face about equivalent to that of the conveyor, usually from 45 ft. to 75 ft.

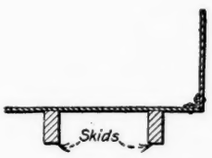


Fig. 4.

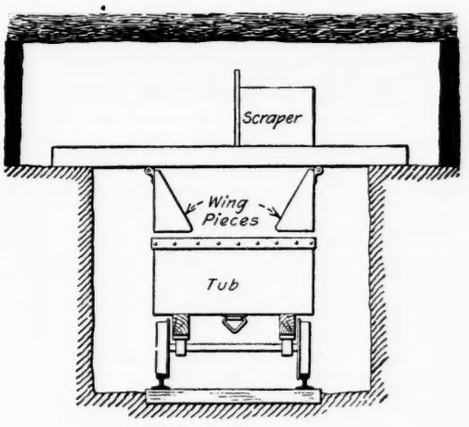


Fig. 5. COAL AGE

FIGS 4 AND 5 SHOW SECTION AND LOADING ARRANGEMENT OF THOMSON CONVEYOR

The Thomson Conveyor

The Thomson conveyor may be described as a broad iron trough having one side removed, built up in sections, each section being 6 ft. long, 21 in. wide, and 8 in. deep on the gob side, the face side being the one left open to facilitate the filling of the conveyor (Fig. 4). The sections are joined one to the other by a shackle and pin, the joints being protected by the sections overlapping each other. Riveted to each section are two strong steel skids, on which the conveyor slides along the floor. As the sections stand 4 in. off the ground, the extreme total height of the conveyor is 1 ft., and it can therefore be used in a thinner seam than any other type, which is one of its advantages.

The conveyor is designed to work in a face twice its own length, the delivery road being fixed in the middle. The conveyor works across the road on a bridge constructed of two steel girders spanning the opening; and to this bridge are fixed one or two scrapers, according as the delivery road is single or double. The scraper is hinged at one end, the hinge being bolted to the bridge, and is prevented from swinging too far in either direction by two pins.

The working of the scraper is automatic, the conveyor pushing it until it attains an angle of 135 degs. to the direction of motion, so that, as the conveyor passes on, the coal is diverted into the car beneath. Two wing-pieces placed underneath the bridge form a chute into the car. Fig. 5 is a sketch of the bridge. It must be noted that these wing-pieces constitute one disadvantage of the conveyor, in so far as they necessitate more being cut out of the road bottom.

I would advise a double road being used, in which case the two scrapers work as already described, one scraper being put out of action as circumstances require by lifting out the pin and swinging it back. The advantage of having the double road is that no time is lost in waiting for a car; but at the same time it must be remembered that a double road is being driven to serve one conveyor only, and not two, as is the case with the Blackett conveyor, for instance.

The makers use only one rope to drive this conveyor, but experience goes to show that it is better to use two ropes working on the main-and-tail haulage principle, which does away with the tension arrangement. If this method be adopted, it is found in practice advisable to have the conveyor working on one side of the timber and the rope on the other. The engine is usually fixed in a recess a little distance along the face. Any type of engine may be used, the horse-power depending entirely on the length of face to be cleared.

This conveyor is easy to move; it is simply drawn up to one end of the face, the main rope is then disconnected, taken round the timber, up the new run, and connected up again. A few props are knocked out near the bridge and the conveyor bodily pulled across into its new position, being guided through the pathway made by knocking out the timber. The last section of trough generally has to be moved by hand. When the conveyor has been completely pulled over, the tail rope is disconnected, taken round the timber, up the new run, and connected up again; the pulleys at the two ends of the face are moved, care being taken to get them into their correct position, as the satisfactory working of the conveyor depends largely on this. Lastly, the bridge is moved into its new position, its correct alignment, which is an important point, usually being determined by the lie of the ropes. This conveyor, like all others, must work in a straight line, but an undulating floor is not so detrimental to its economical working as in other types.

The Bunker Conveyor

The bunker conveyor is the cheapest and simplest of all the conveyors; it consists essentially of trams, the size and number of which depend entirely on local conditions. In the conveyors of this type which the writer has seen, the trams were made of sheet iron, with all four sides sloping at an angle of about 30 degs. towards the bottom. The dimensions of the bottom of the tram are 3 by 2½ ft., and the depth on the gob side 18 in., the face side being again lower to facilitate the filling of large coal. The bottom, which is the great feature of this conveyor, consists of two doors hinged at the ends, opening outwards and downwards and normally kept shut by means of a bar and pin, as shown in fig. 6. Fig. 7 shows a side elevation of a tram with the doors open. The trams are connected together by a shackle or coupler and run on rails which bridge the delivery road in a manner similar to the Thomson conveyor. It is the usual practice to make the gauge the same as that of the pit cars, although this rule need not be adhered to.

The engine driving this conveyor is situated in a recess in the gob near the delivery point, and the driving rope passes from the front end of the trams around a pulley at the top end of the face, back on to the driving wheel of the engine, whence it passes round a pulley at the other end of the face, finally finishing up on the back of the trams. The method of driving may thus

be compared to endless haulage. The necessary tension on the rope is obtained by means of a Sylvester pulling bar attached to one of the pulleys at the end of the face.

Almost any type of engine can be used for driving the conveyor, but a totally enclosed engine is to be preferred. The method of filling with this type of conveyor is as follows:—The car is brought up under the bridge, the first tram of the conveyor brought over it and the doors opened, thus allowing the coal to fall into the car, when empty, the doors are shut; the next tram is brought into position, and the process is repeated until the car is full. One of the chief advantages of this conveyor is that it will operate almost any length of face; but it is the better practice to have the delivery road in the middle of the step being worked.

The conveyor is moved in the following manner:—The trams are first drawn up to one end of the conveyor face, the tension is slackened, the rope uncoupled and coiled up, and the rails are moved and relaid in their new position until the trams are reached. The trams are then lifted across on the rails already laid, the remaining rails fixed in place, and, finally, the engine is moved. The rope is then coupled up to the tension, and adjusted. This is the only type of conveyor on which alignment and undulating floors have no serious economical bearing. It is efficient, and is easily lengthened, and in addition, since the design is so simple, the cost of upkeep and repairs are correspondingly small.

Two Conveyors Should be Used

The most economical method of working conveyor faces is to have two conveyors, one a few yards in advance of the other, delivering into one gate road. The road should be laid with a double track, having the bottom cut out to such an extent that the tubs will pass under the conveyors and be driven on from 10 to 12 yards in advance of the first conveyor, so as to allow of standing room for cars. Should circumstances not permit of a double road being carried, it is better to have two face conveyors delivering into one gate conveyor; and when within 100 yards of the limit to which it is intended to carry the workings forward, I would suggest, as a general practice, the use of a gate conveyor, thereby saving the cost of driving the last 100 yd. of road.

The Blackett conveyor, when used as a gate conveyor, can be lengthened to suit the advance of the face, and herein lies one of its advantages. It will also be clear that continuous running conveyors, such as the Blackett or Sutcliffe, are more suitable for delivering into gate conveyors than the other types described.

The efficiency of a conveyor depends manifestly on the rapidity with which the cars are changed, and this is one of the difficulties of conveyor work, more particularly so when a single road only is available, or when a gate conveyor is used. In order to cope with this difficulty, it is desirable to use as large a car as possible, and to keep the permanent mechanical haulage close to the face.

Great difficulty in the successful working of conveyors arises from the presence of small faults, not merely because they present obstructions in working by breaking the continuity of the coal face, but because they also give rise to an undulating floor and bad roof, and assist in bringing on pressure or weight.

Conveyors, an Aid to Safety

Conveyors are a valuable aid to the rapid advancement of the face; their use also involves the systematic setting of timber, as much labor is saved when moving the conveyor if the posting be regular; while the rapid advance in the face and the systematic setting of timber, make for increased safety to life and limb by securing a better roof. Weight upon the coal is beneficial in making the working easier if the coal is hard; but, if the coal is friable, weight tends to produce a large percentage of small coal. Here, again, speed in working is economical, since the weight has a shorter time in which to act; and as conveyor work involves keeping the face straight, weight is more uniformly distributed, and an increase in the percentage of round coal results. The effect of weight on the floor is to make it heave, more particularly if the floor be soft or moist, and cases have been known where machine mining and conveyor work have overcome this difficulty—again by promoting rapid working of the face. From these remarks, it will be gathered that where it is advisable to work with rapidity, machine holing and the use of conveyors are advantageous, as the speed of working is from five to six times as great as by hand labor when both are used, or, with conveyors alone, from two to two-and-a-half times as great.

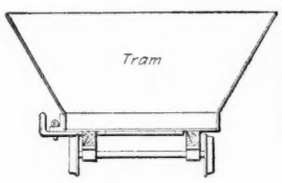


Fig. 6. Cross-section, Bunker Conveyor

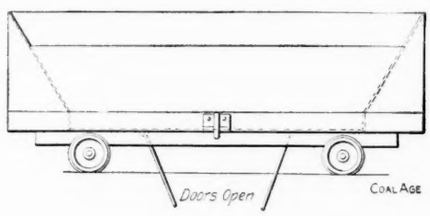


Fig. 7. Side View of Same Conveyor

Difficulty in Gob Filling

No reference has yet been made to the building of the pack or gob. In beds which do not make sufficient dirt, and which necessitate the making up of the gob, this is a difficult question; taking in filling for the gob is an expensive item, and affects seriously the results obtained from conveyor work, as, so far as I have observed, there are no conveyors which appear to be specifically designed to take in dirt, although most types are capable of doing so. If the gob is not built up with refuse, and especially if the seam is liable to great weight, the use of very strong timber on the gob side of the conveyor is unavoidable, in order to keep a good roof ahead, while allowing the roof to break down behind.

As regards the distribution of labor on the face, the great advantage of continuous-running conveyors, such as the Blackett and Sutcliffe, lies in the fact that every man gets an equal chance of using the conveyor. In other types, the men working near the delivery road will have the use of the conveyor for a greater length of time than those working further along the face, as, obviously, while the entire length of the conveyor passes the former, they have an added advantage in the slight delay required for unloading, whereas the latter only get a proportionately decreased length of conveyor and time for filling it. In order that the best possible output may be secured from the end of the conveyor-face, more labor is therefore usually concentrated there than at, or near, the delivery road.

The question of machine mining and conveyor work in very steep seams is an interesting problem. Cutters of the bar type can be used, and have been used, in seams of very high inclination; but, when the use of conveyors in steep seams is being considered, the "angle of rest" for the broken coal comes into play. This angle, which is not fixed, varies for different sizes and qualities of coal; where the seam, however, is too steep to allow of mechanical conveyors being used, a "natural" conveyor can frequently be made by using the floor as the bottom of a chute.

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Of this issue of Coal Age, we will print 7000 copies No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

Another Minimum Wage

The minimum wage provision demanded by the anthracite mine workers is wholly different, more logical and in accord with economic principles than that which the labor leaders and the miners of England are demanding.

In that country, the miners hope that arrangements may be made whereby men who cannot earn a minimum on a simple tonnage basis may receive what is rated as a living wage. The rate is not placed unreasonably high, but it is high enough that men who desire to shirk their task can avail themselves of the minimum clause to assist in trifling their time away at the working face on the pretence that they can accomplish little because they are laboring in an "abnormal place" where the presence of clays, faults, binders or rotten roof, makes coal extraction slow and difficult.

Economically the demand of the anthracite miners is sound. They ask that when the operator desires to pay them by the day instead of by piecework, they shall receive $3.50 for eight hours' work. We do not attempt to say whether this is or is not the wage the miner should receive. We do not make any pretensions to the possession of the infallibility of those who seem gifted with the power to decide the due compensation of laboring men. Some of these wiseacres are sure that a day's wage should not exceed a dollar. Others think ten times that pay is due to the man who bears the heat and burden of the day. But what we do say is that the proposed minimum is not merely a living wage, but an adequate provision for comfort and even for modest luxury.

No matter how frantically the dailies, influenced by the wishes of their readers, may try to show that the fight is for a living wage—the promise of the barest clothing and most meager fare—the truth is, the miners of the anthracite region are not engaged in such an heroic struggle. They are fighting for comforts. The stranger in anthracite towns will note the many saloons lining the streets, almost all owned by one-time miners who have accumulated money by fairly remunerative toil, and who are using their surplus to debauch their fellows.

Let it be added that if any anthracite miner lives in a hovel, it is because he so prefers, usually because years of use have made it more suited to his tastes than a larger house. He should receive commiseration not because he is poor, but because, in many cases, a chance to live better makes no appeal to his impoverished mind.

On the other hand, the high wages paid in the anthracite region have produced workingmen of a high class, owning their own homes and well performing family, local and national duties. These men, sober, honest, hard-working Americans of whatsoever extraction make more difficult the decision as to what a day's labor should bring.

Archives

A commendable practice of the state and federal governments has been to print and place in the hands of the public a series of archives, describing the events of public interest in past history. One notable feature of such an enterprise will be eagerly awaited toward the close of this year, when the state and federal statisticians will give us figures on mine tonnages and on the accidents which occurred in the far away year of 1911.

It is true that some state reports on mine tonnages and accidents are being delivered in this very month of February, but it may be added that all the state officials, who are trying to vindicate themselves by this apparent promptitude, have had a full eight months to complete their reports, as their fiscal year ended June 30.

From our Britannic cousins, who, if reports be duly credited, vie with those of Philadelphia for slow motion, we have long ago received a report of all mine accidents suffered in 1911, this report, covering three separate schedules of collieries, metalliferous mines and quarries.

The British report gives a statement for each mine-inspection district, and divides up accidents according to cause.

It is true the British advance proof does not cover several of the items of interest, because these cannot be obtained and tabulated in a week. The complete issue will come later. Nevertheless, there is no reason for our slowness. The coal companies should be urged to keep their books ready for the annual returns. They should keep on hand for immediate use the sizes and horsepowers of their equipment units. In all probability most inspectors do warn the superintendents and managers of their duties in this respect, for some inspectors have long ago filed their 1911 returns at the state capitols.

We confess the trouble appears to lie higher up. Fortunately, this year accidents of magnitude have been few, and there has been a breathing spell for the inspectors, during which time, this work, which must ultimately be done—be it sooner or later—could be hurried to completion. We know that the inspectors do hurry the coal operators into compliance, and the U. S. Geological Survey is likewise insistent, but why should any operator care? In what harm does his dilatoriness result? For the reports, when filed with an inspector, classified, summed and turned into the chief, are permitted to lie in disuse on the state files.

It is to be hoped that, year by year, operators, inspectors, statisticians, printers, proof readers and binders will learn that every day's delay makes the reports they render to the public more of the nature of archives than of returns, less useful to the reader and less true to the conditions existing at the date of issue.

Mine Refuge Chambers

Some time ago there was considerable agitation favoring the use of refuge chambers as a safety precaution in case of explosions and mine fires. Several coal companies in this country followed up the idea and provided their mines with such rooms. The provision of this type of safeguard is not nearly as general as the need warrants. The idea has been followed to a much greater extent in European mines, and the records show that in those emergencies when the plan was tested, satisfactory results were obtained.

Almost every week we read of some particular case where one or more men have been closed in a mine and perished through lack of respirable air and sufficient food, which might have been supplied to them if they could have reached a properly equipped refuge chamber. The actual need of such safety rooms in each particular mine, of course, is not an everyday occurrence; however, if the urgency for such protection comes to each company but once in a decade, the expenditure necessary to supply such provision is justified and the foresight of the management vindicated.

It would be a good idea if all mines were divided into districts completely separated one from the other by a fairly continuous pillar. In this plan, each district should be provided with a refuge chamber. In shaft mines, a fireproof chamber should also be located near the escape shaft.

In German mines, such refuge chambers are equipped with a protected telephone line put down through a drill hole into the chamber itself. Air is also supplied through this same hole. These emergency rooms are supplied with food, water, safety lamps, dry-cell electric lamps, oxygen-rescue apparatus, chemical fire-extinguishers, rolls of brattice cloth, and first-aid kits. The size of such a chamber should be determined largely by the physical characteristics of the coal seam, and especially by the number of men who are employed in the district which the refuge room is to serve.

In constructing such an emergency chamber, it is well to see that the room neck is long, the side pillars unusually thick, and the nearby entries as narrow as possible; the observance of these points reduces the amount of masonry work to a minimum. One authority suggests that each room should have two 30-in. entrances leading from the main, or cross entry and equipped with two or three heavy doors, opening inward, and fastened into the masonry.

In one case, at a European operation, the estimated cost of six underground chambers was three thousand dollars. It is probable that if this same mine had been supplied with electricity and compressed air, the cost would have been reduced to about two thousand dollars.

Where there is no compressed air, the mining company would have to supply small motor-driven compressors, or better still, hand ventilators designed to circulate air through the drill holes—one hole being used as an intake and the other hole as an exhaust. Also, it would be easily possible to arrange and perfect a plan on the surface, whereby air could be sent down one drill hole into the rescue chamber. This would avoid the possibility of the ventilation plan failing through the destruction of underground electric or compressed-air lines.

The Engineer and Electricity

It must have seemed a reasonable conclusion some ten or fifteen years ago that the application of electricity to mining would advance more rapidly than along most other lines because as a source of power it is so peculiarly suited to the problem presented by the average mine. And yet, although it has been successfully applied to practically every phase of coal-mining work, from shot-firing to haulage, it cannot be said to have been either so rapidly or so generally adopted as its merits would lead one to expect. Indeed, it would seem to be, as was said recently at a meeting of the North of England Institute of Electrical Engineers, that in the application of electricity to some of the problems in coal mining, the engineer has shown an excessive amount of caution—even timidity.

While it is not intended to condone, much less advocate, the practice of taking any risks in connection with a fiery or dusty mine, and while it is recognized that perhaps the first duty of the engineer is to secure the safety of the miner, still it should be pointed out that in the application of electricity to coal mining, there is presented no problem that reasonable ingenuity cannot solve.

Unfortunately, where an element of uncertainty is found to exist in regard to the use of electricity in a particular instance there seems to be a tendency to take refuge in repressive legislation rather than in trusting to the inventive capabilities of the present day. Are we becoming less resourceful as well as more cautious, or is there here evidence of a lamentable disposition to let well enough alone, even in the face of needs so pressing as to show conclusively that all is not "well enough"?

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Sealing off a Mine Fire

(Continued from Feb. 17)

Letter No. 28—If there is a fire at the face of a pair of butt entries with an air current flowing up the one and down the other, we would seal it off in the following manner:

After ascertaining the local conditions as far as possible, and finding that no difficulties peculiar to the location were to be apprehended, we would approach the fire as near as possible with as light a current of air as our men could work in. If the last crosscut could not be reached, we would travel up to one which was closed, knock the stopping down, and await the effect of practically clearing the crosscut of smoke. This accomplished, we would erect a brattice cloth partition from the corner of the crosscut half way across the return air course. This would enable us to reach such a position as to allow of the erection of a cloth brattice and later of a board stopping across the return air course. We would then close the intake with a board brattice. Later brick stoppings should be put in.

The reason for closing the outlet first is to cut away from the fire the accumulated volume of gases between the point of location of the first stopping and the up-cast shaft. This method permits the sealing of a fire with the minimum of danger.

N. D. MONSARRAT,
2nd Vice-President.
D. H. WILLIAMS,
District Supt.
Sunday Creek Co., Glouster, Ohio.

Letter No. 29—I have read the Foreword in the issue of COAL AGE, Jan. 20, 1912, and make the following deductions:

Manager was notified of fire and location of same; men had started to work inside of fire; hoisting of coal had begun, at the mine; relay squads were fighting fire; main entry was the intake, the back entry, the return; mine gave off gas; was examined by fireboss. Whatever may have been the origin of the fire it had not been in progress long, and it may be assumed that no accumulation of gas had occurred, in the 12 or 14 hours since the last shift quit on Tuesday, 5 p.m. From the reports it appears there is no disturbance of the ventilating current.

It having been decided to seal off this fire, I would open up the crosscut between the main and back entries at the nearest possible point to the fire, so as to short circuit the air current at this point and prevent its reaching the fire. I would then run a line of brattice (Fig. 1) from this crosscut up the main entry, select a good place as close to the fire as safety would permit, and build the first stopping there on the main entry. I would so arrange the brattice that it would carry only sufficient air to supply the men at work and keep away the smoke and fumes. The brattice must be hastily built of any material at hand; a board stopping will do. In the back entry, I would erect the same kind of brattice, but it would be necessary to carry more air forward in the back entry, owing to the smoke and fumes coming down this entry from the fire.

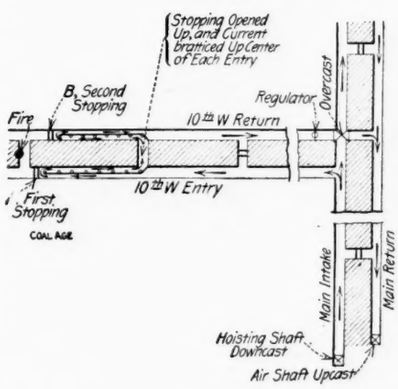


FIG. 1. SHOWING PROPOSED MANNER OF STOPPING OFF A MINE FIRE

I have seen it suggested (it is a German idea) that a good temporary stopping can be built from bales of hay. These bales are first stacked in the entry and wedged tightly with loose hay to make the stopping as nearly air-tight as possible, and then the hay is wetted, which causes it to swell. This makes a tight stopping, and the hay is said to be practically incombustible when properly baled. If no water line was available I would use a bucket brigade. The baling wire holding the hay should be cut before it is wetted, so as to allow of the free expansion of the hay.

Even if the crosscut was not opened up as I have described, I would place the first stopping on the main entry, as close to the seat of the fire as practicable. Then, when building the second stopping on the return airway, I would still be able to carry air by bratticing from the main-intake air course.

From the description given in the Foreword of Jan. 20, I have assumed the circulation to be as shown by the arrows, in the accompanying sketch, Fig. 1. Assuming this arrangement is correct, perhaps the quickest way to handle this fire after building the first stopping on the intake would be to build the second stopping behind the regulator, although if conditions would permit I should want to place the second stopping nearer to the seat of the fire and reinforce by building other stoppings, if necessary. In any case, substantial stoppings should be built immediately after and in front of the two temporary stoppings. These can be built of any material available.

In our state, one of the largest operating coal companies, the Norwestern Improvement Company, build all of their stoppings with logs, six, eight and ten feet long, the ends being wedged and the whole plastered. Broken mine timbers can often be utilized for this work. Each stopping is formed of a double wall of timber, and the space between is filled with clay or sand. Pipes should be built into each stopping, one at the bottom for draining the water, and the other at the top for testing the air for gas, in the inclosed space. This will permit of the taking of samples of the air inside the inclosure, in order to make a test from time to time, of its gaseous condition. These pipes are plugged. If it is desired, a steam line may be attached to the end of one of the pipes, at any time, and live steam introduced into the area to extinguish or dampen down the fire.

Conditions must always determine whether it is better to close the intake or the return airway first, in any particular case. In the case described in the Foreword, I think the first place for the stopping to be built would be on the intake, whether the crosscut was open or not.

J. B. MCDERMOTT,
State Coal Mine Inspector.
Helena, Mont.

Letter No. 30—The question under discussion on mine fires, as I understand it, is to seal off a fire which has gotten beyond control. The words "beyond control" certainly mean that we have a serious fire, one which covers quite an area

and is giving off great volumes of poisonous fumes and smoke.

The first step to be taken is to short-circuit the air in the nearest crosscut to the fire. I would then build a stopping on the intake entry, which could be done in practically pure air; then close the return airway, which can usually be done without much difficulty after the intake has been closed, as it has been my experience that the volume of fumes and smoke gradually diminishes after the first stopping has been completed.

I would certainly consider it a dangerous practice to take men beyond the intake entry a distance of from 40 to 60 ft. to get into the return airway to build the first stopping. It is a common occurrence to have a heavy fall in the burning section, which forces the fumes and smoke out into the intake entry, making it necessary to retreat to fresh air as quickly as possible. Now if men were required to travel a distance of from 60 to 80 ft. through these fumes and smoke, it is probable that some of them would get down and the workmen would certainly become disorganized and the work delayed. An accident to the fan would have practically the same result. I fear that some of the readers have not considered the extent of the fire; however, the question is plain, and refers to fires which have gotten *beyond control*.

W. F. MANDT.

Longacre, W. Va.

Letter No. 31—A definite answer to the mine-fire problem cannot be given, as every difficulty demands its own solution and the local conditions must govern. The principal thing to be done is to attack the fire *promptly*, and for this reason the work of building stoppings should be begun at the earliest possible moment. First decide where the stoppings on the intake and return are to be built and proceed with the work at once.

While decision is being made as to which stopping to close first, the framework for a heavy door stopping can be erected and the heavy door itself made. This door can be arranged in a variety of ways: It may be installed so as to be closed by a heavy weight attached to a rope over a pulley, a trigger attachment holding the door open till withdrawn by means of a long rope extending to the surface, if necessary. Or the door can be closed by the direct pull of the rope.

The door-frames having been built and the doors hung, these can be left open until the men have *all been withdrawn* from the mine. Then the doors are closed simultaneously or in the order which has been in the meantime decided upon by the management. By this means the men are all in a place of safety when the doors are closed. This plan was first used in 1906 by the Lehigh Valley Coal Company engineers. If the rope is to be used to close the door by a direct pull, it can also later be used to pull down the door without entering the mine in case it is the desire to do so. This was so in the case noted above, where the door was later demolished by means of the rope.

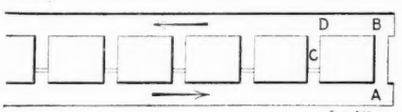
This plan often requires a long rope, but rope is cheap in comparison with the cost of a mine fire. A hoisting or haulage engine is usually necessary when the rope is long and no pulleys need be placed, as the engine can pull the rope around corners and pillars if necessary. If the door is not to be demolished later, a weak piece of rope should be inserted near the door to break when the door is closed.

A. B. JESSUP,
Mining Engineer.

Lehigh Valley Coal Co.,
Wilkes-Barre, Penn.

Letter No. 32—I wish to express my views concerning the best method of closing off a mine fire. I have assisted in subduing several during the 56 years I have been connected with mines.

Ten years of this period were spent in the bituminous-coal field of South Wales, which pitches from 15 deg. up to about 45 deg.; twelve years in the semibituminous longwall workings in the same coal field, and the remaining 34 years in the anthracite-coal field of the Wyoming valley, Penn.



ILLUSTRATING CONDITIONS EXISTING AT MINE FIRE

Whether the intake or the return is closed first is not material if the section of the mine where the fire is located is not very gassy. But when feeders or blowers are numerous, and strong in pressure, it is important that the return airway should be closed first. Twice I have built stoppings in the intake before I closed off the return, when the place was very gassy as described above, and both times an explosion took place. But not on even a single occasion did the gas explode when the return was shut off first. It seems that the intake airway quickly fills with an explosive mixture and this reaches the fire before the smoke produced from its combustion becomes dense or thick enough to prevent such an explosion. But when the return airway is closed first it produces such a heavy incombustible atmosphere about the seat of the fire, that any firedamp reaching the same becomes nonexplosive. If two places are driven parallel with crosscuts at stated intervals, as shown in accompanying sketch, of course each crosscut is closed by a stopping as a new one is completed. Therefore, the intake current passes by *A*, and returns at *D*.

Assuming the fire is at *B* and that said fire becomes beyond control, the first thing that must be done is to build a temporary door in crosscut *C*. Then the stopping in that same crosscut should be torn down. This secures a passable approach to the return airway *B* so that the quantity of air coursing at *B* is reduced. Also by this means material can be accumulated near the point *D* for building up the stopping at that point. All the props must be erected before any boarding is commenced. If much CO or CO_2 is present in the return from the fire, the men must be changed very often; in fact, at five- or ten-minute intervals. Then, when everything is ready, put on the boards quickly from bottom to roof. In so doing the density of the smoke becomes such that part of it fills the heading between *B* and *A*, and therefore prevents the accumulated firedamp from becoming explosive at the seat of the fire. No doubt you will find many opinions in the matter, and each man as positive as his opponent that his methods are correct, but those who have gone through the "fire of experience" under different prevailing conditions will hesitate long before they will allow the intake to be closed first.

W. D. OWENS,
District Superintendent.
Lehigh Valley Coal Co., Pittston, Penn.

Susie, Wyoming, Explosion

No doubt you have received a report on the explosion that occurred at mine No. 4 of the Kemmerer Coal Co., Jan. 20, 1912. I inclose a rough sketch of the mine, but did not have time to put in the rooms. I have made this sketch from memory, not having the map before me, but I believe it represents correctly the arrangement of the entries.

Referring to the sketch, there was a rock stopping at *A*, a box regulator at *B*, and between these, at *C*, was a canvas stopping that had been cleated down tight at the top and bottom. The rock stopping at *A* and the regulator at *B* were each blown toward each other by the force of the explosion. Under these conditions, I would like to ask, how would you account for the fact that the canvas stopping was not blown out, but was still in place after the regulator and the rock stopping were both found to have been destroyed? As I stated, each of these were blown in a direction toward the foot of the return airway. I would like to have COAL AGE and any other of its readers who have had similar experiences offer some explanation of the reason why this canvas stopping was not destroyed.

W. H. GEORGE.

Frontier, Wyo.

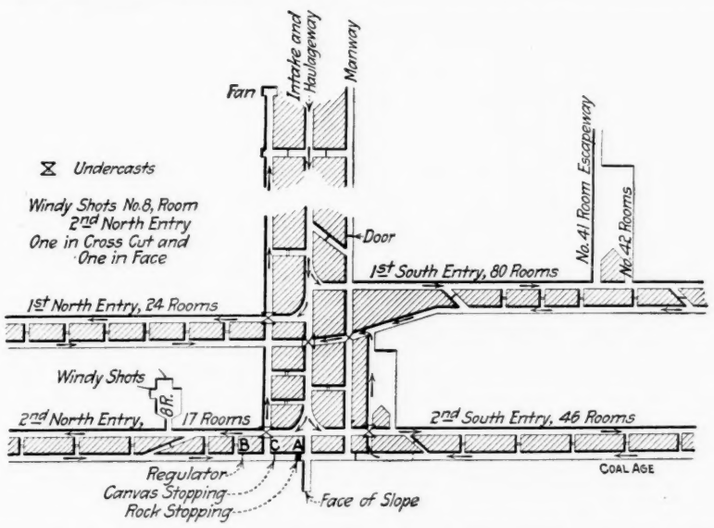
It rarely happens that a mine explosion of any considerable importance oc-

curs where the later investigation does not reveal many things that appear to be almost inexplicable. We are, however, confronted with the fact of their existence, and the question asking for an explanation is therefore a reasonable one.

It reminds one of the story of a prisoner who was found by a friend in a prison cell. After the first expression of surprise on the part of his friend, the prisoner was asked, "But how did you come here; what did you do?" The story of the arrest was briefly told. "But," said the astonished friend, "they could not jail you for that." The prisoner's response was, "Whether they *could* or *could not* is not the question; they *did*, and I am here."

So in a mine explosion, it is idle to talk of whether this or that could or could not have taken place. If it is a fact that sketch sent us by our correspondent and which is the only information at hand at present, shows that if the expanding gases formed by the explosion took the natural course, feeding on the fresh air of the intake airway, the main haulage slope would be the principal outlet. If the initial force of the explosion were sufficiently strong, much of the shock of the blast would also be exerted up the return slope toward the fan. This, however, would be determined only by the character of the explosion, whether it was chiefly a gas or dust explosion.

To obtain an intelligent idea and solution of what took place at the moment of the explosion, the mine must be considered as a cul-de-sac, which in point of fact it was. In this case, the force of the explosion is exerted from within outward in the direction of the



SKETCH PLAN, SHOWING A PORTION OF MINE NO. 4, KEMMERER COAL CO., SUSIE, WYOMING

is presented, the question, "How did it occur?" is a proper one. Our correspondent states that the tightly cleated canvas brattice at *C* was not destroyed by the blast that blew out the much stronger rock stopping and the box regulator, on either side of it, each of these being blown toward the foot of the return slope.

Assuming that this is a statement of fact and that the canvas brattice at *C* was not injured, the natural conclusion is that either there was a balance of forces exerted on the opposite sides of the canvas stopping; or that the force of the blast on each side was killed or wholly absorbed by the work done before it reached the canvas.

The first of these two assumptions appears the more probable one when one studies the airways and follows on the map the direction the blast would travel in reaching the mine opening. From our information the explosion originated in one of the rooms on the second north entry and was probably caused by one or more blown-out shots. The map or openings. The resistance offered by the airways to the gases thus propelled at a high velocity through the slope causes a kick-back on all the stoppings in the immediate vicinity.

It is a law of mechanics that action and reaction are always equal. If a man jumps forward he exerts an equal reaction, in the opposite direction, on the ground. The action of an explosion of gas in a mine is in every respect similar. As a consequence, two stoppings inby from *B* are blown out by the initial blast and almost simultaneously there is exerted the full pressure of the blast on both the regulator at *B* and the rock stopping at *A*. Both of these pressures would be exerted toward the canvas brattice at *C*. The pressure at *B*, however, is the direct pressure remaining after destroying the stoppings mentioned, while the pressure that blew down the rock stopping at *A* would be a kick-back due to the resistance met in propelling the gases up the slope to the mine openings.

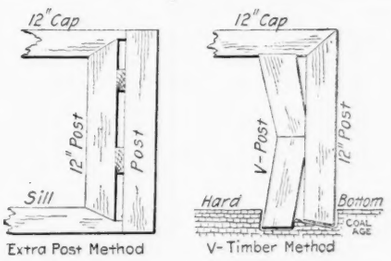
This is only offered as a possible, but at the same time a reasonable solution. It is an interesting question and COAL AGE hopes many of its readers will offer their own solutions.

Timber Framing for Side Pressures

With reference to the article appearing in your issue of COAL AGE, under date of Jan. 20, 1912, regarding timber framing for side pressure, by Joseph Virgin, of Plymouth, W. Va., I agree with him that when the timbers are notched, the leg or cap will invariably split, before either the post or cap has taken the weight they are expected to sustain. In this sketch, however, the small angular piece nailed in the interior corners does not add materially to the strength of either cap or leg; the only support it gives is the resistance of the nail, and we get practically no strength from the piece of timber itself.

Again, I know Mr. Virgin personally, and I am sure a man of his experience would not set the post at an angle of 45° from the perpendicular to support a side pressure, even if the ends or the upper corners were cut at such an angle.

I realize that he has increased the size



DOUBLE TIMBERS FOR SIDE PRESSURE

of the post from 10 to 12 in., making it 2 in. thicker than the cap, but in my opinion, the pitch given the leg counteracts the extra thickness given the upright leg. The side pressure is the same on the leg, no matter what angle it is set on, but it also has to sustain a top pressure, in proportion to the degree it is set from the perpendicular.

Therefore, I think the best way to resist the side pressures, is to place extra support in the side timber. This may be done either by increasing its thickness, by putting an extra post at the back of the leg, or by using timber in the shape of a V, with the cap and the floor for the two ends to rest on, and joined in the center of leg, as shown in the accompanying sketches. The tendency of the side pressure would then be to push up the cap, or down in the floor, or both, and in this way we get the extra strength of these supports added to the strength of the leg.

MINE SUPERINTENDENT.

Johnstown, Penn.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Is Carbon Dioxide a Poisonous Gas?

Will COAL AGE please explain exactly what is or should be meant by a "poisonous gas," in mining; and state whether carbon dioxide should be classed as a poisonous mine gas?

MEMBER FIRST-AID CORPS.

Birmingham, Ala.

The meaning of poisonous is "injurious to health or tending to destroy life by impairing its functions." There is no doubt but that there are wide degrees of poisonous qualities.

Some poisons destroy life almost in an instant. Such are hydrocyanic acid, carbolic acid, carbon monoxide gas. Other poisons are slow in their action, but none the less sure in effect unless relief is obtained.

In mining practice, it is customary to class as poisonous only, two of the common mine gases; namely, carbon monoxide (CO) and hydrogen sulphide (H_2S). Carbon dioxide (CO_2) has not been considered as a poisonous mine gas. That is not to say, however, that carbon dioxide is not poisonous.

A clearer understanding will be gained by comparing this gas with pure nitrogen, which forms practically four-fifths of the volume of the air we breath, and which cannot be said to have any poisonous qualities whatever.

Pure nitrogen could not be breathed, for any time, without causing death by suffocation; but this is not due to any action of the nitrogen on the blood or tissues of the body. It is due simply to the exclusion of oxygen from the lungs, which oxygen is necessary to life. Likewise, when pure carbon dioxide is breathed, for any time, death ensues, because of the exclusion of the necessary oxygen from the lungs. However, while the presence of so large a proportion of nitrogen in the life-sustaining air amply warrants the assumption that nitrogen has no poisonous qualities whatever; there is not the same warrant of assurance in respect to carbon dioxide, which is the discarded refuse—the chief waste product in sustaining life. It would be unwarrantable to assume or even suggest that this refuse gas possesses *no* poisonous qualities.

In the mine, carbon dioxide forms a variable but important part of the mixture known as *blackdamp;* the other chief constituent being air poor in oxygen. As is well known, the breathing of blackdamp for a greater or less period of time produces drowsiness, headache, nausea, followed by ache in the back and limbs. These symptons indicate the action of insidious poison that slowly impairs the functions of life. Is it to be attributed to the nitrogen in the residual air; or to the vital functions not receiving a sufficiency of oxygen; or to a poisonous action of carbon dioxide? All of these possibilities exist in the noxious blackdamp. To answer this question we must look for a further comparison of these gases, under a similar depletion of the normal percentage of oxygen.

Compare, for example, the fatal artificial atmospheres formed by adding nitrogen and carbon dioxide, respectively to pure air until a mixture fatal to life in a like period of time, is produced. The lowest percentages fatal to life when these gases, respectively, are added to pure air are shown in the following table, "Mine Gases and Explosions," page 144:

FATAL ARTIFICIAL ATMOSPHERES FORMED BY ADDING NITROGEN AND CARBON DIOXIDE, RESPECTIVELY TO AIR, SHOWING COMPOSITION OF MIXTURE AND PERCENTAGE OF GAS ADDED

Gas added to pure air	Composition of mixture (Per cent.) N_2	O_2	CO_2	Proportion of gas added
Nitrogen	93.0	7.0	...	2 volumes
Carbon dioxide	64.9	17.1	18.0	⅔ volume

The above shows clearly that carbon dioxide acts on the vital organisms in another way than to produce simply suffocation by the exclusion of oxygen in sufficient quantity from the lungs. Fatal effect is reached by the addition of but ⅔ volume of carbon dioxide to 1 volume of air, depleting the oxygen to only 17.1% (normal 20.9%). In the case of nitrogen, it is necessary to add twice the volume of the air, thereby depleting the oxygen content to 7%, before producing a fatal atmosphere.

What Is a Combustible Gas?

Is oxygen a combustible gas? The textbooks say it is a supporter of combustion, but why is it not also combustible? What is a combustible gas?

CHEMIST.

Denver, Colo.

Oxygen is the universal "supporter of combustion," because it is the active agent in the atmosphere that makes combustion generally, possible. The process of combustion in oxygen is termed "oxidation."

All combustion, however, is not oxidation, although all oxidation *is* combustion, in the broad meaning of the term. It may mean the slow oxidation of iron, in a damp atmosphere, or the slow combustion of fine coal in the gob, in a mine; or it may refer to the rapid combustion of wood, coal, or other combustible, in a blazing fire. In each case, the iron, coal, wood, etc., is consumed and is no longer iron, coal, or wood. Instead, there remains the oxide of iron, or oxide of carbon—a new substance; and the change, in each case, is some form of combustion.

Combustion may take place in other atmospheres than oxygen; but it is not then oxidation, unless, perchance, oxygen is burned in an atmosphere of hydrogen. When hydrogen is burned in an atmosphere of chlorine; or chlorine is burned in hydrogen, combustion takes place, but there is no oxidation. The hydrogen and chlorine are consumed, and a new substance, hydrogen chloride is formed. The burning of sulphur in hydrogen produces hydrogen sulphide.

It is clear that the question of whether any gas or other substance is or is not combustible is simply relative, depending on the atmosphere in which the combustion, if any, must take place. Thus, wood, coal, oil, or other substances that are highly combustible in air are not combustible in an atmosphere of nitrogen, carbon dioxide, or other gas containing no available oxygen.

Oxygen will not burn in air any more than it would in nitrogen or carbon dioxide; because air contains no gas for which oxygen has sufficient affinity to cause chemical union under these conditions. Oxygen is therefore not combustible in air, but it is combustible in hydrogen. Likewise, and for the same reason, chlorine gas is not combustible in air, but burns readily in an atmosphere of hydrogen.

Strictly speaking, from a scientific standpoint, it is not a complete or exact statement to speak of any gas or other substance as "combustible"; except where it is clearly understood that the meaning is, "combustible in air." This is the usual meaning when not otherwise stated.

A gas or any substance whatever is combustible in a given atmosphere when it is capable of being consumed in that atmosphere.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Questions for Beginners

Mine Resistance

Ques.—What produces the resistance that a mine or airway offers to the passage of the air current?

Ans.—The resistance is due both to the friction of the air rubbing on the sides, top and bottom of the airway, and the obstructions met by the current in its passage, such as timbers, falls of roof, contracted breakthroughs or crosscuts, sharp bends in the entries, etc.

Ques.—How is the resistance of a mine commonly measured?

Ans.—Resistance in ventilation is determined by the ventilating pressure it produces in the airway or fan-drift. To ascertain the ventilating pressure it is necessary to measure both the inches of water gage and the area of the airway in sq.ft. Then, since 1 in. of water gage corresponds to a pressure of 5.2 lb. per sq.ft., the total ventilating pressure is found by multiplying the inches of water gage by 5.2, and that product by the area of the airway. Thus, calling the resistance R; the unit of ventilating pressure or pressure per sq.ft. p; the sectional area of airway a; and the water gage $w.g.$; the formula for mine resistance is

$$R = p\,a = 5.2 \times w.g. \times a.$$

Example—Find the mine resistance when the water gage reads 2.5 in., in an airway 6x10 ft. in cross-section.

Solution — $R = 5.2 \times 2.5\ (6 \times 10) = 780$ lb.

Ques.—(a) What is meant by the coefficient of friction in mine ventilation. (b) Give its symbol and value commonly used.

Ans.—(a) The coefficient of friction is the *unit of resistance*, which means the resistance per sq.ft. of rubbing surface, for a velocity of 1 ft. per min., in the air current.

(b) The common symbol for the coefficient of friction and its value are

$$k = 0.00000002\ lb.$$

Ques.—(a) Upon what does the resistance of a mine or airway depend? (b) How does the resistance of a mine or airway vary?

Ans.—(a) Resistance depends on three factors; namely: 1, coefficient of friction k; 2, rubbing surface s; 3, velocity of air current v.

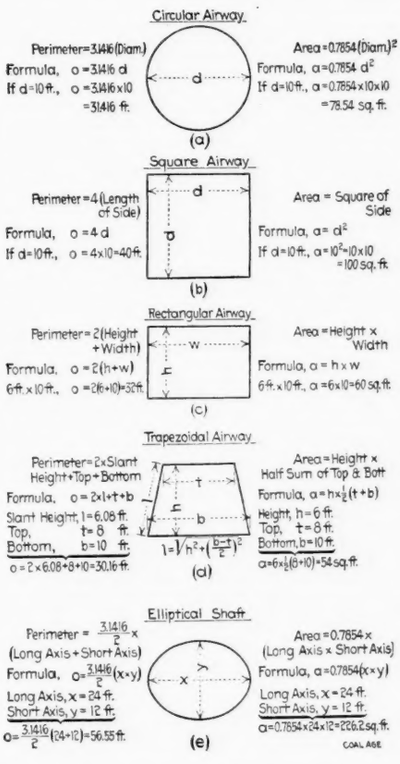
(b) Resistance varies as the rubbing surface s, and the square of the velocity of the air current.

Ques.—Give the formula for calculating the mine resistance when the rubbing surface and the velocity of air current are given.

Ans.—The formula for mine resistance calculated from the rubbing surface s and the velocity of the current v, is

$$R = k\,s\,v^2.$$

Example—Find the resistance of a mine when the size of the airways is 6x8 ft. and 5000 ft. long, including the re-



Perimeter and Area of Airways of Different Section

turn; and the air is traveling with a velocity of 8 ft. per sec.

Solution—First, find the rubbing surface by multiplying the perimeter of the airway by its length; thus,

$$s = 2(6 + 8) \times 5000 = 140{,}000\ sq.ft.$$

The velocity of the current is

$$v = 8 \times 60 = 480\ ft.\ per\ min.$$

Then, the mine resistance is

$$R = 0.00000002 \times 140{,}000 \times 480^2$$

$$R = 645.12\ lb.$$

Example—(a) Find the unit of ventilating pressure in the last example. (b) What is the water gage?

Solution—

(a) $$p = \frac{Resistance}{Area}$$

$$p = \frac{645.12}{48} = 13.44\ lb.\ per\ sq.ft.$$

(b) $$w.g. = \frac{p}{5.2} = 0.26\ in.,\ nearly$$

Ques.—Does splitting the air current in a mine change the mine resistance; and, if so, explain the effect of splitting.

Ans.—When the air in a mine is "split," the current is divided between two or more airways. The rubbing surface remains the same; but the *area of passage* in the mine is increased in proportion to the number of air currents traveling through the mine. It is evident that an airway 10x10 ft., 5000 ft. long, has a rubbing surface of $4 \times 10 \times 5000 = 200{,}000$ sq.ft., and an area of $10 \times 10 = 100$ sq.ft. Now, if the air passing in this mine in a single current can be made to travel the same entries in, say 2 splits, each 10x10 ft., 2500 ft. long, the rubbing surface is still $2\ (4 \times 10 \times 2500) = 200{,}000$ sq.ft., but the area is $2(10 \times 10) = 200$ sq.ft., or double the original area.

Now taking, first, a simple case where the air is divided at the mine entrance and passes through the mine in two separate currents, if the *power* producing the circulation remains the same, the rubbing surface being unchanged, the velocity of the air passing in the 2 splits will be the same as the velocity in the original single airway. This is true, because the velocity of the air depends only on the rubbing surface and the power applied to the air, without regard to the area of the airway. Thus, 10 hp. applied to a 10x10-ft. airway will produce the same velocity as this power would produce in a 6x8-ft. airway.

The mine resistance depends only on the rubbing surface and the velocity of the air. Hence, for the same power on the air, the mine resistance will not be changed by splitting the air current into two or more separate splits.

In common practice, however, the air is not divided till after it has traveled a greater or less distance through the shaft and main airway, and likewise the return current must travel the main return airway and upcast shaft in a single current, which reduces the power on the air at the point where the air is split. In this case, both the velocity and the resistance are reduced by splitting.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Mine Accidents and Their Prevention

The illustrations on our front cover are taken from the book, "Mine Accidents and their Prevention," written by J. H. Dague and S. J. Phillips under the supervision of R. A. Phillips, general manager, and C. E. Tobey, superintendent of the mining department of the Delaware, Lackawanna and Western Railroad Company. The book is published at the expense of that company for the instruction of their mine workers and certainly reflects great credit on all concerned.

The publication is intended largely for mine workers having a limited knowledge of English and is planned not only to instruct them in their mining duties, but to give them a working knowledge of the words used in describing their work and the tools they employ. Though the book is complete, it will be supplemented by the verbal instructions of the mine foreman, and to make his teaching successful, the European miner is provided in this book with a sufficient vocabulary whereby foreman and miner can make themselves mutually understood.

THE USE OF PICTURES IN TEACHING

Teaching by pictures is not new. It has been proved by psychologists that a student will remember words better by association with pictures of the objects they represent than by placing those words side by side with their translations into the language of the pupil. This was exhibited some few years ago in the submission of Japanese words to pupils together with pictures illustrating them. Other Japanese words, together with their English equivalents, were likewise submitted, but it was found that the pictured words were more largely retained by the memory.

The immigrant is moreover possessed of a small vocabulary and one not usually correctly comprehended by him, and consequently a picture is more valuable than any other instructing medium. Many miners were employed as farm laborers in their home countries, and the objects in the mines they have to name for themselves with words which are doubtless not recognized in the technological dictionaries of their own or any country. Consequently translation is not easy.

But it is not nouns which principally try the foreigner. The elusive verbs, prepositions, adjectives and adverbs are his main trouble, and so the Roberts system of instruction is followed in this admirable mining primer. The sentences grow progressively harder, starting with "The miner is in the chamber" and "He lights a squib," to longer sentences which describe the pictures with which our front cover is graced: "The miners drill is too small at the sharp end. This drill will not make a hole large enough for the cartridge. The miner drilled a hole with this drill," and so on. Following these sentences are statements significantly printed in red ink: "He tries to force the cartridge into the hole with the drill. The drill strikes a spark. The spark flies into the powder. The spark sets off the powder." Down the side of the page are words used for the first time in the lessons and to which the attention of the student and his instructor is drawn. The book ends with notes on "how to become an American citizen" and gives questions, an applicant may be required to answer.

So excellent a book has not come to our notice for some time. It is an evidence that one at least of the anthracite coal companies has the training, citizenship and safety of its employees closely at heart. It is to be hoped that means may be taken to make such instruction general.

The Other Half

BY CHARLES L. FAY

(*Continued from Feb.* 17.)

There are social students, like Dr. Steiner, who make a careful study of living conditions by a life in the environment, within which they try to uplift the worker, whose objects are not self-seeking and whose solutions are not premature. But what of some of the professional, "just out of school" investigators and writers for publicity bureaus and current literature? Is it not possible that some young and well meaning enthusiasts, fresh from college and obsessed by a spirit of socialism gained from socialistic, though scholarly literature and society environment, go to a "field" with their ideas of the conditions already *fixed* and then absorb only such incidents as will brace their fixed ideas? The mind of this type of investigator is so completely—though unconsciously—impervious on the one side and sponge-like on the other that part of the truth is automatically resisted while another part is as automatically absorbed.

Then, again, are not some investigators too "hurried" in their work? To cite a case in point. An investigator and writer will visit a coal-mining community to get data for an article on the conditions of mine workers. This writer will spend about two days in the "field," see the one or two labor leaders and perhaps one or two mine superintendents and ride through the community by automobiles, trolley cars and trains, looking at back yards, streets, water supply, beer wagons and "living conditions" from the windows of the fast moving vehicles, while his knowledge of local labor conditions is gained from a half-dozen brief interviews. Then, away to the hotel, pullman car or home office and pen picture after pen picture is produced by this facile writer. Some societies seem to believe in this type of investigation, some magazines innocently accept the "dope" while yellow journals "devour" it and cry for more.

This and similar types of investigation are back of a great deal of data which go in printed form to the public and contribute only too largely toward the forming of what we know as public sentiment.

Miners and operators welcome, I am sure, fair investigation of social conditions in coal-mining communities, when the investigation is carefully made by competent and unprejudiced investigators. But when writers are too biased to draw fair conclusions, too superficial in their investigations and treatment of a subject to assure the presentation of all facts or make *studies* simply to get "copy" for carelessly edited or yellow journals, then resentment is justifiable.

The loss to society and the danger, however, is in the power for evil in the wrong public sentiment thus created and in the prejudices thus stimulated.

Treatment for Carbon Monoxide

The treatment for carbon-monoxide poisoning is very simple. Remove the patient to the fresh air without delay. Keep the patient warm and administer oxygen at once. If necessary administer artificial respiration. This can be done by placing the patient in the prone position with the head turned to one side. Then press on the lower ribs at the rate of fifteen times a minute. When the patient has recovered, forbid all exertion and watch carefully for some time as relapses are apt to occur. Do not attempt to treat carbon-monoxide poisoning in an atmosphere that contains even a small quantity of that gas.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Interstate Commerce Commission has rendered a decision in the case of the Elmore-Benjamin Coal Co. vs. the Cleveland, Cincinnati, Chicago & St. Louis Ry. Co. *et al.*

The facts in the case show that in December, 1910, by permission of the Illinois railroad and warehouse commission, the carriers engaged in transporting bituminous coal to Chicago from the fields in Williamson and Franklin Counties, Ill., increased their rate 7c. per ton. At the same time a similar advance was permitted by the Interstate Commerce Commission in the rate to Chicago from the adjacent, or Harrisburg, field in Saline County, Ill., the movement from this district being interstate. On June 22, 1911, this advance was applied to the joint rate to Milwaukee. Under this adjustment the rate from Williamson and Franklin Counties continued to be 3c. per ton higher than the rate from Saline County. Effective in July, 1911, defendants attempted to equalize these rates by increasing the latter 3c., but the proposed advance was suspended by order of the commission. Complaints were filed attacking both the actual and proposed advances from the Harrisburg field to Chicago and points beyond, particularly to Milwaukee.

Finding of Commission

After full hearing and investigation, it has been held (1) That the advance of 7c. per ton is not found to be unreasonable or unjustly discriminatory nor to subject the Harrisburg field, Milwaukee, or the traffic in question, to any undue or unreasonable preference or disadvantage. (2) That the defendants have sustained the burden of proving the propriety of the proposed advance of 3c. per ton. Orders will be issued dismissing the complaint and vacating the orders of suspension.

In speaking of the conditions of competition in the coal trade which gave rise to this case, the commission says that the testimony introduced by complainants in these cases was largely addressed to the commercial competition which coal from the Harrisburg district meets at Chicago and Milwaukee. At Milwaukee this competition is from what may be called Appalachian coal, which moves by rail from the mines to the lower lake ports and thence by vessel. The allegations of the complaint indicate that this coal is delivered at Milwaukee at a total rate much lower than the former rate of $1.45 from the Harrisburg district.

It developed at the hearing, however, that the all-rail rate from Harrisburg to Milwaukee embraces services not included under the rail-and-lake combination from the Appalachian Mountains to Milwaukee, and that the total cost of getting a ton of coal from the Pittsburg or Eastern districts to Milwaukee was not simply the sum of the rail rates from the Eastern mines to the lower lake ports plus the lake rate to Milwaukee, whatever that might be, but involved the cost of unloading the vessel at the dock at Milwaukee, loading cars from the stores at the dock and switching from the dock to the required deliveries.

Coal from the Harrisburg field appears to be of fairly high grade as compared with Indiana-Illinois coal generally. Indeed, it may be stated that it is on the whole of superior quality, but it cannot be stored like Eastern coal without deterioration and it does not rank as high in heat-producing power as coal from the Eastern districts with which it competes.

Freight on Mine Car Wheels

The Interstate Commerce Commission has issued its decision in the case of the Diamond Coal & Coke Co., vs. the Baltimore & Ohio Ry. Co. *et al.* In this it holds that the rate on mining-car wheels from Rock Island, Ill., to Diamondville, Wyo., is unreasonable so far as it exceeds the rate on mining cars between the same points. The Commission says:

"Complainant contends that the commodity rate of 97½c. applicable on mining-car skips should also be applied on a part of the skip. The testimony shows that the wheels are an integral part of the skip and are subject to such rough usage in the mines that it is necessary to replace them several times before the body of the skip is worn out. Had these wheels been shipped with the bodies there would have been no question that the 97½c. rate was applicable. A shipment so made would not load nearly so heavily as a shipment of the wheels alone. The bodies of the skips are bulky and cannot be loaded to utilize all available car space. The wheels can be loaded compactly and require for transportation no equipment different from that provided for the bodies. Under the rate of 97½c. a particular car loaded with wheels would produce more revenue than one loaded with skip bodies or with the completed skip, including the wheels. Upon consideration of all the facts disclosed by our investigation, we are of opinion, and so find, that the rate assessed west of the Mississippi River for transportation of these car wheels was unreasonable so far as it exceeded the commodity rate of 97½c. applicable to mining-car skips."

Alabama

Birmingham—Announcement is made that a syndicate has been formed to underwrite the merger of the Alabama Consolidated Coal & Iron Co. and the Southern Iron & Steel Co. Harvey Fisk & Sons, of New York, are the managers. The new company will be known as the Alabama Consolidated Iron & Steel Co. and will issue $1,032,000 of 6 per cent. cumulative preferred, $4,130,000 common stock and $4.130,000 of 6 per cent. 20-year gold bonds.

The first battery of coke ovens at the Tennessee Coal, Iron & R.R. Co.'s new byproduct plant has been fired and the first coke turned out. The plant is being built at a cost of about $3,000,000 and in addition to producing coke and various byproducts will furnish gas power for a large electric plant that is to be erected in conjunction with it.

Arkansas

Denning—The coal tipple at mine No. 2 of the Western Coal Co. was destroyed by fire, Feb. 7. Two shot-firers were the only men in the mine at the time of the fire. They were quickly notified and escaped by climbing out the manway. About 300 men are thrown out of employment. The origin is unknown.

Colorado

Denver—Railroads engaged in coal traffic from southern Colorado to Oklahoma and Texas points, have been ordered by the Interstate Commerce Commission to establish joint rates and routes into these states from the Walsenburg district of Colorado within 90 days. This order was issued to enable Walsenburg coal shippers to compete on a fairer basis with the Canon City operators.

Illinois

Carlyle—The engine and boiler houses of the North Breese Coal & Mining Co., at Breese, were destroyed, Feb. 6, by a fire that was caused by an employee

dropping a lighted torch where waste and oils were stored. The flames spread instantly and soon were beyond control. Loss is $50,000, covered by insurance. The building will be rebuilt.

Medora—A 6-ft. vein of coal was recently discovered while drilling for oil on a farm in Shipman township. The seam was encountered at a depth of 180 ft. and is reported to be of excellent quality. The find was made at a point within a few hundred feet of the Chicago & Alton R.R.

Chicago—A proposed advance of 10c. in the minimum freight charge on small shipments to be made by all the railroads east of the Mississippi River and north of the Ohio was declared recently by the Interstate Commerce Commission to be without justification. An increase of 7c. a ton in the freight rate on bituminous coal from the fields in Williamson and Franklin Counties to Chicago was sustained by the commission.

Harrisburg—The annual convention of the Illinois Mine Workers will meet here, Mar. 10. The convention will urge that legislation be directed toward the provision of wash houses at all the mines.

The O'Gara Coal Co. has equipped a complete mine-rescue station, similar to those being established by the United States Government. The O'Gara company has 17 mines in the Harrisburg district, and the rescue station is centrally located so that any of the mines can be reached in a comparatively short time in the event of an accident.

Peoria—E. S. Barlow has decided to make every effort to pump the water out of his coal mine, near Kewanee. The mine was flooded recently, when an underground body of water found its way through the overlying strata, and caused operations to be suspended. A large pump has already been installed.

Indiana

Brazil—The Supine Coal Co., of Brazil, has leased 1000 acres of coal land near Center Point and is producing coal, clay and shale in large quantities. The work is being done with steam shovels and this method of operation is proving much more suitable and profitable than some previous attempts at mining in this section of the field. Similar operations are being carried on near Parkersburg and in other sections of Clay County. The miners are inclined to regard the advent of the steam shovel and stripping methods with considerable disfavor.

Indianapolis—It has been widely reported that certain business interests in this vicinity and in Illinois will petition Congress to intervene in order to prevent a suspension of mining at the expiration of the present wage-scale agreement. J. C. Kolsem, who presided at the recent joint conference of operators and miners, disclaims any knowledge of such a move being contemplated.

Kansas

Pittsburg—Employers of labor are slow in coming in under the provisions of the workmen's compensation act that went into effect Jan. 1. The act is not compulsory. So far only six coal companies have accepted its conditions.

Kentucky

Louisville—According to President Wheelright, the Elkhorn mines of the Consolidation Coal Co. will begin shipment early in the spring. Mining has already begun and the coal is being stored while awaiting the completion of the Sandy Valley & Elkhorn R.R. which is being built by the Baltimore & Ohio.

When the new branch of the Lexington & Eastern R.R., from Hazard to the coal fields east of Whitesburg, completes the tunnel just outside Hazard and two cuts, all the grade work will have been finished. One cut, near Boone Hill, will be finished in about 30 days, and the other, near Blackey, at about the same time. This causes the railroad officers to assert that the first train will be run into Whitesburg by May 1. The people of that section, as well as coal operators, are looking forward with much anticipation to the possibilities of the extension of a railroad to the center of Letcher County.

Barbourville—One of the most important announcements that has been made recently regarding Letcher County coal lands is that of the Lexington & Eastern authorities to the effect that a 5-mile spur line will at once be laid out, up Cholly Creek and that construction work will begin as soon as the weather permits. This spur will reach into a large territory, rich in coal and timber, and should greatly increase the traffic over the main line. The Currier Lumber Co., which owns a railroad terminating near the Kentucky-Virginia border, has announced that during the present year it will extend its line over into Kentucky and about six miles up the Pound River.

Michigan

Detroit—Reports from all over the state of Michigan indicate that the scarcity of coal is being severely felt. Large consumers in the Detroit district have appealed to the Interstate Commerce Commission to break the coal blockade at Toledo, Ohio. Through the inability of the Michigan railroads to receive cars consigned to them, the blockade reached an acute stage more than two weeks ago. Hampered by nearly 50 days of almost continuous zero weather, and by the heavy snowfalls that have prevailed throughout the northern portions of the state, the Michigan Central, the Pere Marquette, and other roads leading north from Toledo, have been confronted with the worst traffic situation in years. It is estimated that there are 8000 loaded cars on the tracks in Toledo, and on the sidings and storage tracks for a distance of 100 miles south of that point.

Ohio

Steubenville—Four hundred and fifty miners at the Bradley mine of the United States Coal Co. went on strike, Feb. 14, as the result of a dispute over pay for bottom coal and over the displacing of a miner who had been sick.

Four thousand acres of Pittsburg No. 8 coal in Munroe County, near Sunfish Creek, were recently sold for $190,000 by O. P. Markle and others, of Uniontown, Penn., who have large holdings in this district. There has been considerable activity of late in Monroe and Belmont County coal. The tract transferred by the Uniontown men is just south of the 21,000 acres recently sold to Toledo, Ohio, interests.

Columbus—The Imperial mine No. 1, at Derwent, in the Guernsey field, will have to abandon its slope entrance and construct a shaft instead, according to a ruling of the state mine inspector, backed up by the opinion of the attorney general. The laws of the state require that when the depth of a mine exceeds 100 ft., a slope shall not be used, and it is said the workings of the Imperial mine lie at a depth greater than this.

Announcement is now made of the completion of an agreement between the Chesapeake & Ohio and the Norfolk & Western R.R., that was stated as being under way last fall, whereby the Chesapeake & Ohio coal will be handled between Kenova, W. Va., and Columbus by the Norfolk & Western Ry.

It is stated that the coming conferences between the officials of the United Mine Workers and the operators of Ohio, western Pennsylvania, Indiana and Illinois, may be held at either Columbis or Cincinnati. When the joint conference at Indianapolis adjourned, some time ago, no place was fixed for the resumption of negotiations. Columbus is a central point in the field and the operators, in general, are said to desire to meet here.

Gallipolis—Representatives of an English syndicate have taken up the options on 8000 acres of coal lands in Perry and Greenfield townships, Gallia County. The same interests are behind the projected railroad from the Ohio River to Lake Erie, which will develop coal lands in Lawrence, Gallia and Meigs Counties.

Oregon

Marshfield— The announcement is made by H. B. Guthrey, president and general manager of the Pulaski Coal & Navigation Co., of Los Angeles, Calif., that his company has purchased the Pike coal property, on the Coquille River, three miles below Coquille. It is the intention of the new owners to develop the mine to its full capacity.

Pennsylvania

BITUMINOUS

Myersdale—L. R. Brandenburg, of Baltimore, W. H. Clark, of Washington, and Col. Edward E. Robbins, of Philadelphia, representing a large eastern mining syndicate, were in Myersdale recently, making arrangements to take over the extensive coal holdings of the Hocking Coal Co., in Brothers Valley Township. It is understood that the new owners will at once proceed to develop the property and market the coal.

Monessen—Vesta No. 5 mine, at Fredericktown, which is claimed to be the largest bituminous mine in the world, recently began active operations. Although some little delay was experienced in getting the new machinery in order, everything is said to be working smoothly. No effort is being made for a "capacity" run and probably none will be made for some time. The officials will content themselves with a thorough trying out of the machinery before operations are begun on a large scale.

Pittsburg—Renewed activity in the coal industry of the Pittsburg district is shown by a report just issued by the Pittsburg-Buffalo company. This concern has recently given employment to 100 additional miners, and it is expected that 300 more will be given work at the company's mines in the near future. All previous records for coal production were broken at the Marianna mine, on Feb. 15.

Rockwood—The Keystone mines, at Casselman, have resumed operation, after being shut down since last July. It is understood that the tipple at the No. 1 mine will be abandoned before long and all the coal will be brought out and loaded at No. 2. Other improvements are also proposed.

Connellsville—A decision was recently handed down in the Westmoreland County courts which forbids coal-mining companies to polute domestic water supplies by draining into them the sulphur water from their mines. The decision was rendered in the case of James McCune against the Pittsburg & Baltimore Coal Co.

Ellwood City—W. C. and J. C. Cunningham, of Hazel Dell, have purchased the Wallace farm and coal mines west of Hazel Dell. They expect to begin operations at once.

Williamsport—The property of the Central Pennsylvania Coal Co. in Lycoming County consisting of about 1000 acres of coal land and improvements will be sold at public auction, March 8, to satisfy the claims of the Knickerbocker Trust Co. of New York.

ANTHRACITE

Scranton—The great demand for coal on account of the continued cold weather kept the average wholesale price at tidewater at a high point during January, and the increase that will come to the mine workers as a result of the operation of the sliding scale will be 7 per cent.

The final hearing in the case of the Marian Coal Co. against the Lackawanna railroad is scheduled to take place Feb. 20 before the Interstate Commerce Commission in Washington. The outcome of the suit will determine whether or not the so called independents or individual operators shall continue to pay what many of them term extortionate rates for having their coal carried to tidewater by the big coal roads. If the commission decides that the rates are high, as is contended by the Marian company, it will result in a reduction not only on the Lackawanna, but on all the other railroads, for coal shipped from within the Scranton zone, which embraces that part of the anthracite region from Forest City to Shickshinny. Under the agreements with the big companies the individual operators get 65 per cent. of the price per ton that the coal roads get at tidewater.

Wilkes-Barre — Coal is being taken from the new Loomis colliery, at Nanticoke, by the Lackawanna railroad. The coal being mined at present, is taken from the Hillman vein, at a considerable depth and transported to the breaker of the Bliss colliery. A breaker will ultimately be built at the Loomis colliery but the plans are not yet completed.

Lansford—The Lehigh Coal & Navigation Co. has filed a bill in equity against the Central Railroad of New Jersey, asking for an accounting by the defendant for all sums expended in payment of rights of way and construction work done on the Lehigh & Susquehanna R.R., which was leased to the Central of New Jersey in 1871 by the Lehigh company. Bill alleges that the Central railroad has not lived up to the terms of the lease.

Utah

Ogden—The Black Hawk Coal Co. recently made its first shipment of coal. The mines have a daily capacity of 300 tons and within a few weeks it is anticipated that this will be increased to 1500 tons daily. The properties are located in Carbon County in southeastern Utah and embrace approximately 1200 acres, the coal vein being from 25 to 30 ft. in thickness. The mines are located on the Utah Southern railroad, about 14 miles southwest from Price and 157 miles from Ogden. Preliminary work commenced in February of last year and approximately half a million dollars has been invested in development work and for machinery.

Washington

Spokane—The Wilson Coal Co., of Centralia, Wash., has conveyed nearly one-fourth of its properties to a new company headed by George Dysart and known as the Sunshine Coal Co. The consideration was about $200,000. The Wilson Coal Co. still retains a large acreage of land on which there are extensive deposits of coal, but the company will not attempt to develop these lands at present, according to H. P. Wilson, secretary of the company.

The Tanum Coal Co., with property lying about 15 miles from Ellensburg, is planning to build a 1½ per cent. grade railroad from the mines to Thorpe, a distance of 7 miles. At this point connections can be made with both the Northern Pacific and the Milwaukee roads.

West Virginia

Wellsburg—It was decreed, Feb. 7, in the Circuit Court of Brooke County that the properties of the Wellsburg Coal Co. and the Wellsburg & State Line R.R. Co. must be sold to satisfy liens of contractors, material men and labor claims. The bond issues of the companies and all transactions pertaining thereto were declared fraudulent. The decree was made in the suits brought by contractors and others in 1905 after the railroad had abandoned its right of way, the coal tipples and other improvements at the coal properties it had planned to develop. The coal company had title to many thousand acres of coal and the railroad owned a right of way through rich farming country. More than $1,000,000 is said to have been involved in the suits.

Great Britain

London—The acuteness of the crisis in the British coal trade is emphasized by the prohibitive rate of 94½ per cent. asked by Lloyds on insurances against a national strike. It is reported that 800,000 miners have already handed in their notices to quit work Feb. 29. The Federation of National Transport Workers has pledged itself not to handle "blackleg" coal, so that imported coal will be landed with great difficulty. The government announces that it will take the crisis in hand although there is as yet no indication of how it proposes to attempt to break the deadlock.

The two-day conference between mine owners and representatives of the miners ended Feb. 20, without reaching an agreement. The British Admiralty has chartered two vessels to carry 10,000 tons of American coal to Gibraltar.

Personals

H. McKean Conner, of Beckley, W. Va., has been appointed superintendent of the Tennessee Coal, Iron & R.R. Co.'s Pratt No. 12 mine, near Ensley, Ala., effective Mar. 1, 1912.

C. V. Westover has resigned as superintendent of the Ludlow mine of the Huerfano Coal Co., Ludlow, Colo., to take a similar position with the Cambria Fuel Co., at Cambria, Wyoming.

C. W. Saxman, formerly mechanical engineer with the Latrobe-Connellsville Coal & Coke Co., Latrobe, Penn., has resigned to take the position of general manager of the Copper Reef Consolidated Mining Co., Globe, Arizona.

Duncan Medill has sold his interest in the Rutland Coal Co., Rutland, Ill., and resigned his position as manager of the Rutland mine to become general superintendent of the five mines near Clinton, Ind., that are owned by John Deering, of Chicago.

John W. Skeele, formerly vice-president in charge of sales of the Lehigh Valley Coal Co., has been elected president of the newly organized Lehigh Valley Coal Sales Co., which has been incorporated with a capital of $10,000,000, to take over and market the production of the Lehigh Valley Coal Co. George N. Wilson was elected vice-president and secretary of the new company, and William J. Burton, treasurer.

Dr. M. J. Shields, of the American Red Cross, intends to devote his almost entire attention to railroad first aid, in the next few months. He will visit Du Bois and Punxsutawney, and at these places and in the vicinity, he will lecture to and organize first-aid bodies among the miners. He will attend with his car the International Congress of the Red Cross Societies, meeting at Washington, D. C., between May 7 and 17, and will preside at a contest to be arranged between teams of miners, policemen, firemen, railroad men and steel workers.

James Needham, assistant general manager of the Union Pacific Coal Co., has resigned to become general manager of the coal properties of the Chicago, Milwaukee & St. Paul R.R. Co., with future headquarters probably in Chicago. Mr. Needham's appointment fills a vacancy occasioned by the recent death of W. W. Taylor, president of the St. Paul Coal Co. The duties of the position formerly occupied by Mr. Needham with the Union Pacific Coal Co. have now been divided. W. D. Brennan, superintendent of the Superior mines, becomes general superintendent of the Superior Coal Co., in addition to his former duties, and George Pride, superintendent of the Union Pacific mines at Rock Springs, Wyo., becomes assistant general manager of that company.

Obituary

George Canbee Clark, president of the Horace Clark & Sons Co., and president of the Clark Coal & Coke Co., died at his home in Peoria, Ill., Feb. 5, aged 65 years.

S. D. Conover, aged 68, died at his home in Dayton, Ohio, Feb. 8. Mr. Conover had been identified with the coal business in Dayton for a great number of years and was one of the city's most prominent business men.

Francis B. Stillman, president of the Watson-Stillman Co., manufacturers of hydraulic machinery, died recently at his home in Brooklyn, N. Y. Mr. Stillman was in his sixty-second year. He was a graduate of Yale in the class of 1874, a member of the Engineer's Club and of the American Society of Mechanical Engineers.

Construction News

Wilton, N. D. — Improvements are planned for the plant of the Washburn Lignite Coal Co., to be made during the coming summer.

Bethany, Mo.—The Cainsville Coal Mining Co. has recently given a mortgage for $250,000 to secure bonds issued to improve the properties at Cainsville.

Cumberland, Md.—The Georges Creek Coal Co. is planning to open up three additional mines on its property at Lonaconing, Md. Mr. Coale is general manager.

Barbourville, Ky.—The Edgewood Consolidated Coal Co. has resumed operations, and will equip a coal-washing plant in addition to installing other machinery.

Hooversville, Penn.—Plans are being prepared for the erection of a large tipple at Mine No. 1 of the Knickerbocker Coal Co. Construction is expected to begin in the early spring.

Pikeville, Ky.—C. H. Gorley, treasurer of the Marrowbone Coal & Coke Co., has announced that the company will rebuild the tipple, elevator, etc., that were recently destroyed by fire, as soon as insurance adjustments are made.

Milwaukee, Wis.—The Kanawha Fuel Co. has purchased 1800 ft. of dock front and will at once improve the property. Total expenditures are expected to reach about $500,000. Three new coal-handling bridges will be installed, as well as other machinery and buildings. A. S. Austin is president.

Duluth, Minn.—The Berwind Fuel Co. will build a large dock and coal-storage plant on the property in West Duluth recently purchased at a cost of $150,000. The plant will have a capacity of about 1,000,000 tons and will be equipped with modern hoisting rigs and coal-handling machinery. It is understood that in all, four large docks will be built or remodeled this year at the head of the Lakes.

Bristol, Va.—In connection with its recently announced contract to furnish a large amount of coal to New England railways, the Virginia Iron, Coal & Coke Co., of Toms Creek, expects to double its output at the Banner operation, and to do this will install additional machinery, including a number of electric motors.

New Publications

NAJPIERWSZEJ POMOCY. P. Blakiston's Son & Co., Philadelphia. 186 pp., 4x6 in.; 49 illustrations.

This book, of which the title is abridged above, is a translation into the Polish language, of the well known "American Red Cross Abridged Text Book on First Aid," by Charles Lynch and M. J. Shields, the leaders of industrial work in the American Red Cross Society. It has already been published in English, Slovak and Italian. The Lithuanian edition will soon follow.

THIRTEENTH ANNUAL COAL REPORT FOR ILLINOIS. Martin Bolt, chief clerk, Springfield, Ill. 445 pp., 6x9 in., illustrated.

This report presents with commendable thoroughness and clarity, the statistics of the coal-mining industry in Illinois for the year ending June 30, 1911. By far the greater part of the information contained in the volume is in tabulated form, and figures for previous years are given for comparison. Notes and descriptive matter are condensed and concise.

COALS AVAILABLE FOR THE MANUFACTURE OF ILLUMINATING GAS. By A. H. White and Perry Barker, compiled and revised by Herbert M. Wilson. Bulletin No. 6, U. S. Bureau of Mines. 76 pp., 6x9 in.; 4 plates, 12 illustrations.

The experiments recorded in this bulletin are dedicated largely to the proposition that since the well known gas coals of western Pennsylvania are rapidly becoming exhausted and their cost is becoming relatively high, it behooves the investigator to determine whether or not coals from other regions may not be successfully utilized in the manufacture of illuminating gas, gas coke and the various attendant byproducts.

The authors present the results that were obtained, largely without comment or inference, and state that they are to be taken as tentative and suggestive rather than as indicating conclusions in any way final. Nevertheless it is evident that not a few of the coals tested give such promise as to abundantly warrant further and more thorough investigation. Eighteen tests on 11 different coals from 10 states are reported.

Trade Catalogs

Electric Weighing Co., 180 Thirteenth Ave., New York. Pamphlet. Electric weigher for ore, coal, cement, etc. Illustrated, 16 pages, 6x9 inches.

The Hirst-Butler Electrical Machine Co., Inc., Reynoldsville, Penn. Catalog. "Little Giant" direct-connected rotary electric mining machine. Illustrated, 4x8 inches.

Best Manufacturing Co., Pittsburg, Penn. Catalog No. 103. 395 pp., 4¼ x 6¾ in.; illustrated. Catalog covers the complete line of material and supplies manufactured by the Best company and also additional material not manufactured by this company but usually a part of power-plant equipment. A few pages of general engineering information are included.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

While consumption has eased off considerably, in response to the warmer weather, the congestion in transportation continues unrelieved and the movement of freight is slow. Both men and equipment in the railroad service appear to have been severely overtaxed during the cold weather, and it is believed that some time will elapse before conditions are normal.

The situation at the Atlantic Coast ports continues acute, some schools and other public buildings being closed because of the lack of fuel; the movement, both rail and water has been slow, but the warmer weather promises to lift the ice embargo on water shipments. Pittsburg reports the market stronger with prices 5 to 10c. higher and mines working 80 to 90 per cent. capacity, depending on the car supply.

Transportation in the Ohio fields is still demoralized and the demand continues heavy with prices strong; the car supply is the predominating feature in Ohio. The president of the largest operating company in West Virginia states that trade conditions are now more encouraging in that state than at any time during the past two years. Bunker trade has been good at tidewater, coal scarce generally and prices firm.

In the Middle West the situation is improving and the past week has witnessed a satisfactory output at the mines and a heavy movement, particularly into Chicago. While the demand has slacked off at some points, due to the milder weather, all free coal is being readily absorbed for storage purposes; the railroads in particular are storing heavy tonnages. The market in the far West continues dull and unchanged.

Boston, Mass.

Mild weather is some relief to the distressing situation that has prevailed here for some weeks. It at least reduces consumption, and if it continues, will raise the ice embargo at a number of points. The ice in Vineyard and Nantucket Sounds has for the most part disappeared, and movement by water is that much improved. The shortage of coal, however, is most acute, and there is apprehension of trouble all along the line. It will take a long time under the best of conditions to recover from the effect of the last seven weeks of unparalleled cold weather.

Anthracite receipts are few and far between. The smaller producing companies seem practically to have gone out of business so far as concerns this market. The larger shippers have been declining orders for some weeks.

In bituminous the only change from a week ago is to higher prices for what little spot coal is available. The freight market is firm at high figures, and there is some bidding up of rates from New York to sound ports, in the anxiety to get entered for coal. All-rail delivery is the slowest yet. On one end of the roads there are upward of 20,000 cars hung up in transit, largely on account of the lack of motive power. Prices for coal at the transfer points are, therefore, on a premium basis. Car shortage is bound to be marked for weeks to come.

Water freights are strong at $1.25, Hampton Roads to Boston, $1.15 to Providence, on the largest bottoms. On barges from New York to Providence and other sound ports, $1.15 is asked.

Prices are as follows:

Clearfield, f.o.b. mines	$1.35@1.60
Somerset County, f.o.b. mines	1.40@1.60
Pocahontas, New River, Boston, Portland, on cars	4.75@5.00
Pocahontas, New River, Providence, on cars	4.50@4.75
Pocahontas, New River, f.o.b. Virginia terminals, for spot shipment	2.85@3.00

New York

Although the weather has shown some moderation, the soft-coal market continues quite firm. There has been no increase in the standing tonnage at New York loading piers and the amount of coal on hand is far below that usually carried. Demand on contract is extremely heavy and shippers are having all they can do to satisfy the requirements of their contracts.

There is some spot inquiry but considering the shortness of the supply in this market, prices have not shown the advance that would be expected under the conditions. The demand for the standard grades of steam coal is so heavy on contract that these coals are all out of the market and about the only coals now obtainable here are the ordinary grades of Pennsylvania and West Virginia steam. These are being quoted on basis of from $2.70 to $2.80 f.o.b. New York piers, which is an advance of about 10c. a ton over what these coals were being offered at last week.

Consumers generally are alive to the possibilities of a strike in the bituminous and anthracite fields the first of April and much anxiety is being shown among them to accumulate stocks for use in the event of such an emergency, but with the short car supply, slow traffic conditions and the general shortage of coal, most of them are meeting with but little success, as the companies are having all they can do to furnish contractors' coal for their actual requirements.

Philadelphia, Penn.

The retail trade in this locality still reports active business conditions. While the week started in with a thaw, this in a measure only helped deliveries, while the house holders are still insistent that their orders be filled promptly. The open weather will also have the effect of improving the deliveries of the railroads, which have been much hampered by the low temperature. The continued mild weather, however, is likely to affect the receipt of new business, although the rumors of trouble at the mines, and reports of shortage of stocks in the hands of the large operators, make every dealer anxious to keep his yard filled, and this same feeling is passed along to the consumer. No size is reported in good supply as yet, orders being filled by the wholesalers from a week to ten days after receipt. The market at this time is likely to be little affected by the weather conditions.

The wholesale dealers still continue to be deluged with orders far in excess of their ability to fill promptly. One large operator states that they are from one to two weeks behind on their orders, and constant receipt of new business gives no opportunity for the placing of any coal in stock. As it looks now, March is likely to be a busy month. February tonnage to date is far in excess of the same period for last year, and little coal will go into the storage yards from now until the first of April.

Pittsburg

Bituminous—Nothing has been accomplished yet by the joint committee appointed before the close of the Indianapolis convention to discuss the wage scale. The coal market has firmed up by 5c. to 10c. per ton. Coal is in excellent demand, partly on account of interruptions to service through the continued cold weather and partly for stocking up purposes in anticipation of a suspension of mining Mar. 31. There has been a

distinct shortage of cars during the past fortnight, and conditions are no better this week. As a rule, mines are operating as full as the car supply will permit, and operations on the whole are at 80 to 90 per cent. of capacity.

Quotations may be regarded as on the basis of $1.15@1.25 for mine-run, as against $1.10@1.15 formerly quoted, previous differentials maintaining, and we now quote as follows: Nut, $1.10@1.20; mine-run, $1.15@1.25; ¾-in., $1.25@1.35; 1¼-in., $1.40@1.50; slack, 90c.@$1 per ton at mine, Pittsburg district.

Connellsville Coke—The market for prompt coke has stiffened up a trifle in the past three or four days, and it is difficult to get the minimum quotations formerly made. Sales of scattering lots of prompt furnace coke have been made in the past week to the extent of 50 to 75 cars, at $1.85, while on Friday one lot of 12,000 tons was sold in the East at this same figure, delivery within a month.

There has been no important negotiating for coke on contract. We continue to quote: Prompt furnace, $1.80@1.90; contract furnace, $1.80@1.90; prompt foundry, $2.20@2.30; contract foundry, $2.20@2.40 per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Feb. 10 at 354,569 tons, a decrease of 5000 tons, and shipments at 3999 cars to Pittsburg, 5679 cars to points West and 912 cars to points East, a total of 10,590 cars, a decrease of 33 cars.

Baltimore, Md.

It was thought here that the rather mild weather experienced about the middle of the week would help conditions materially. Contrary to expectations it did not, and operators report that they are having as much trouble procuring the necessary equipment as they did earlier in the week, or even during the period of zero weather.

The Western Maryland has experienced all sorts of trouble in moving coal traffic during the past few days and conditions have not been much better on the Baltimore & Ohio, although the management of both roads are doing everything within their power to improve conditions.

The coke market, according to reliable reports from the trade, continues strong. The market is showing greater improvement than has been noticed for nearly a year.

Buffalo, N. Y.

It is generally impossible to get a quick delivery from most of the railroads and some of them are doing next to nothing. The weather has turned mild now, but the cars are not moving and probably will not move at all briskly for some time, as the motive power was overtaxed by the weather and the men are badly used up from cold and overwork.

There is a disposition on the part of the coal consumer to stock up now against a possible strike in April, but the shipper cannot furnish the coal. The mine output is less than it was before the cold weather set in and now there begins to be complaint that the empty cars are not coming back promptly, for the reason that they have not been taken to destination and unloaded.

Prices are nominally as before, though the premium is sometimes liberal when coal is to be had on the spot. Pittsburg quotations are $2.60 for three-quarter, $2.50 for mine-run and $2.25 for slack, with Allegheny Valley about 30c. less. Coke remains strong at $4.25 for best Connellsville foundry and $3.50 for stock.

Anthracite shippers are but a short time, some say three weeks, ahead of the consumers, though this is hard to calculate. As a rule, the retail dealer has no coal at all and the consumer has only a small supply. The only reassuring feature of this trade is that the operators announce that they are not going to advance their prices. Independent anthracite is bringing a good premium where it can be had and delivered to customers.

Cleveland, Ohio

The break in the weather this week does not seem to lessen the demand for coal. The temperature has been in the neighborhood of 34 deg. for the past two days. While the prices in the Cleveland market continue strong, the chief factor in the situation is the car supply. The railroads and larger corporations have all doubled their orders in anticipation of a strike.

Smokeless coal is variable in price, but in strong demand, and what little there is of spot smokeless, commands a price of $1.15@1.25 for mine-run.

Prices range as follows:

Cambridge	
Mine-run	$1.15
¾-in.	1.25
Slack	$0.90@0.95
Ohio No. 8	
Mine-run	$1.10
¾-in.	1.20
Slack	$0.85@0.90
Ohio No. 6	
Mine-run	$1.25
¾-in.	1.35
Slack	$1.00@1.05

Columbus, Ohio

Demoralization still continues on all railroad lines leading from the Ohio coal fields, and as a result the trade is in a chaotic condition. Congestion of way points and connecting lines has made it almost impossible to move much coal and reports show there is considerable suffering in Michigan and northern Indiana points. It is not the fault of the operator who is ready and willing to ship the coal if the railroads could move the cars and return the empties to the mines promptly.

As a result of these conditions prices have been ruling firm on all grades and varieties. Premiums are being paid for spot coal ranging from 10 to 25c. There is a good demand for fine coal and prices are firm.

Reports show that in many points in Michigan factories were compelled to shut down to permit the small supply of coal to be used for domestic purposes; little of this was necessary in the State of Ohio.

Production in Ohio fields was considerably curtailed because of the car shortage and railroad congestion. Many of the mines were closed down almost entirely and others only ran a portion of the time. The reports show that the output was between 35 and 50 per cent. of normal, and in some fields the percentage was even lower. The operators were willing and ready to produce a much larger tonnage, but railroad facilities were such as to make this impossible.

Retail trade has been rather active as stocks in the hands of consumers had to be replenished. Prices have reached the usual winter level.

Prices prevailing in Ohio are:

Domestic lump in Pomeroy Bend district	$1.85
Domestic lump in the Hocking Valley	$1.60@1.75
Three-quarter inch	1.45
Nut	1.20
Mine-run in eastern Ohio	1.05@1.10
Mine-run in the Hocking Valley	1.15@1.20
Nut, pea and slack	0.80@0.90
Coarse slack	0.70@0.80

Cincinnati, Ohio

Because of unusual market conditions, all persons connected with the coal trade are trying to figure some way out of the difficulty, due to inadequate transportation facilities, if not management, on the part of the railroads. Lack of equipment possibly is the real cause at the bottom of the trouble.

Most of the railroads have issued embargoes against further transportation of coal to the congested points, in the hope that they will thus be enabled to clear the yards now filled with cars of fuel. It is said that in Toledo alone there are 12,000 cars of coal awaiting delivery. Other northern points, particularly in Michigan, are said to be in much the same fix. The railroad yards in this immediate market are also well filled with cars, although it is said the railroads have adopted a policy of keeping the congestion from the largest cities as much as possible, because of the clamor that would be raised by the coal men in demanding that their cars be moved. With the cars at a more distant point, they cannot so readily ascertain just what the conditions are and cannot make their demand so concrete.

Prices now being quoted for the various grades are as follows: Smokeless lump, $2.15@2.25; smokeless mine-run, $1@1.25; splint lump, $1.10@1.95, according to the wide range of quality en-

tering this market; splint mine-run, $1.10 @ 1.25; splint nut and slack, 65 to 95 cents.

The quotation on smokeless mine-run is almost entirely a speculative one, since it is impossible to buy that fuel and next to impossible to get the nut and slack. Wholesalers are refusing to accept any orders and are begging each other for the accommodation of a car or two to fill their contracts. Even by helping each other out as far as possible, they are having great difficulty, and sometimes are unable to meet their own requirements.

Charleston, W. Va.

Demand for coal is strong, but the car supply is holding a strong check on supplies. Prices likewise are strong and a fair increase is reported in many instances. These conditions prevail in both the Kanawha and New River districts, and while there has been a slight improvement in the car situation, it has been very slight. At the present time the mines are only operated about three days a week, which is an indication that the car supply is only half that which the mines could utilize, providing, of course, the demand was sufficient to operate at capacity.

Prices in the Kanawha and New River districts are reported as follows:

Kanawha	
Mine-run	$0.85@0.90
Slack	0.65@0.70
Lump	1.40@1.60
New River	
Mine-run	$1.15@1.25
Egg	1.60@1.80

Hampton Roads, Va.

Coal is still scarce at Hampton Roads ports and prices are firmer; none of the standard grades of New River and Pocahontas are being sold at less than $2.70 f.o.b., while some sales of nut and slack have been made on a basis of $1 f.o.b. mines. There are still, of course, considerable amounts of low-price contract coal being shipped to New England, and the U. S. Navy has been taking more coal than usual.

Bunker business has been exceptionally good and several cargoes have been loaded for the West Indies, but the European export trade has been seriously held back by the high steamship rates, the rate to Buenos Aires and La Plata being quoted at $6.72 and to Genoa or West Italy, $4.08 to $4.32.

The movement of coal from the mines has been slow on the Chesapeake & Ohio and the Virginian Railways; the Norfolk & Western has been giving good movement, but the car supply on all roads has been extremely bad.

Dumping has also been slow, owing to the frozen condition of the coal in cars. After the railroads get over the effect of the cold weather, there should be some record-breaking shipments, as the demand for coal is strong and seems likely to continue so. From all accounts stocks of coal in New England are low and all contractors are being pressed for coal, which demands they are most anxious to fill, in order to get rid of all their low priced business and to be in a position to take advantage of the better prices.

Louisville, Ky.

Due to the car shortage primarily, the price of coal in the mining regions of the southeastern part of the state has been shoved up to a point not equalled for two or three years. Outside of the fact that lack of equipment prevented the shipment of coal in quantities equal to the demand, the miners of that section have had an unusually prosperous year. The operators in the southeastern section have built up an excellent market in the North, which is expected to grow steadily. The increased railroad facilities being provided and the installation of selling agencies in the North has resulted in the Kentucky mines competing with the West Virginia output more successfully than has been expected.

Indianapolis

There has been an active week in coal mining with a satisfactory output, and the demand has kept up, notwithstanding the moderate weather. A number of mines throughout the state are advertising for miners, and full time in most all the mines is being worked. Whether preparation is being made for a cessation of mining after Apr. 1 is not positively known, although there are some evidences of it.

The Indiana mines are now being operated at nearly full capacity and that means a large output. Miners' wages are totaling more than at any time for 14 months.

There has been no increase in the price of coal nor is there likely to be unless a cessation of mining shall afford an excuse for same.

Nashville, Tenn.

Business still continues brisk in the west Kentucky coal field, even though the weather is back to normal.

The scarcity of cars is still in existence and all operators are far behind with their deliveries. The month of March will be a good one in view of the fact that the first of the month will catch the cities with practically no coal and there will be a certain tendency to do some stocking locally; there has also been, in the last few days, a number of foreign inquiries, most of which, however, are for outright purchases, commencing Apr. 1.

The demand for screenings is still large and good prices are being offered; in fact, prices will continue good from now until Apr. 1. Operators in this district are awaiting with great anxiety the result of future meetings and conferences between the operators and miners in the union fields.

Chicago

A general tendency to buy for storage against the possibility of a strike and the unusual export movement are the chief features of a steady market which has upward tendencies in several respects.

As a result of a scarcity of cars in southern Illinois only a small volume of washed coal was shipped to this market and as an outcome there has been a heavy demand for nut coal. The latter had previously occupied a weak position in the market. There has been a big demand and a small supply of smokeless and mine-run is sold at $1.25 to $1.35.

The market for screenings has been steady although the great bulk of the buying has been done by the smaller interests. Heavy orders are being received for anthracite, but the shippers have been able to satisfy the demands. There is a keen demand for coke; gas house is scarce and strong.

Prevailing prices at Chicago are as follows:

Sullivan County:	
Domestic lump	$2.87
Egg	2.87
Steam lump	$2.37@2.57
Screenings	1.97@2.07
Springfield:	
Domestic lump	$2.67@2.82
Steam lump	2.32@2.42
Mine-run	2.12@2.22
Screenings	1.92@2.03
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.22@2.32
Mine-run	2.17@2.27
Screenings	1.87@2.00
Pocahontas and New River:	
Mine-run	$3.25@3.55
Lump and egg	4.20@4.30

Coke—Prices asked for coke are; Connellsville and Wise County, $4.65@4.75; byproduct, egg and stove, $4.95; byproduct, nut, $4.75; gas house, $4.90@5.

Minneapolis—St. Paul

The retail coal business in the Twin Cities has dropped off considerably in the last three days due to the mild weather. The wholesale men are only doing a fair business because the dealer in the country is not ordering freely, as he has some coal that was ordered during the cold weather and which is now coming in.

The car situation is not exactly what it should be as there still seems to be a shortage at the mines and the docks. However, the railroads deserve a lot of credit in their attitude of trying to overcome this shortage and coal men believe they have done everything in their power to prevent the usual coal famine which has prevailed in the Northwest nearly every winter.

Dockmen say the supply of anthracite coal in all sizes is low at the docks and the opening of navigation will find the docks practically clean. Prices on dock and all-rail coal for shipment into the country are strong. Franklin and Carterville County coals are selling for $2 and up to $2.50 and the other grades of Illinois coal are selling for $1.75 up. A lot of the coal coming into the Twin Cities now is on contract.

St. Louis, Mo.

The latter part of last week brought a slump in the market on all coals, and the weather the beginning of the present week was anything but favorable to the market. The only thing that keeps the market in fair condition at the present time is the fact that the railroads are buying heavily from all fields, and that steam plants have started to stock up to some extent. The car shortage is also a factor in keeping the prices up, as the mines on the Illinois Central are working but one day a week; the Iron Mountain mines get about four days a week and the C. & E. I. from four to five.

In the Standard field the market seems to be dropping, with indications that it will perhaps be better the latter part of the present week. There is an excellent demand for screenings, but the other sizes seem to be off, and indications are that the screenings market will continue to get better, while the market on the screened sizes for the greater part of the coals will remain about as it is.

There is a good demand for anthracite, or there has been, but failure to deliver has caused many cancellations. Coke is in good demand at prices that have remained steady for the past two weeks. Smokeless is moving freely, with a good demand, and the high grade coals from the Standard field are holding their own at from $2 to $2.25 at the mines.

The prevailing prices the beginning of the week were as follows:

Franklin County	
Lump and egg	$1.85@2.00
No. 1 nut	1.75@1.85
No. 2 nut	1.50@1.65
No. 3 nut	1.25@1.35
2-in. screenings	1.00@1.10
Carterville	
Lump and egg	$1.75@1.85
No. 1 nut	1.50@1.60
No. 2 nut	1.35@1.45
No. 3 nut	1.20@1.30
Screenings	0.90@1.00
Mine-run	1.20@1.25
No. 1 washed	1.75
No. 2 washed	1.60
No. 3 washed	1.50
No. 4 washed	1.25
No. 5 washed	0.75
Standard	
6-in. lump	$1.50@1.60
2-in. lump	1.25@1.40
3x6-in. egg	1.15@1.25
No. 1 nut	1.10@1.15
No. 2 nut	1.00@1.05
Screenings	0.80@0.85
Mt. Olive	
6-in. lump	$1.50
2x6-in. egg	1.25
No. 1 nut	1.15
No. 2 nut	1.05

Spokane, Wash.

The prices of coal in this territory remain the same, with no changes expected in the near future. Local dealers are well stocked and the demand is not heavy. Warm weather is prevailing, the temperature ranging from 35 to 50 deg. and no more cold weather is expected.

Portland, Ore.

There is little change in the situation here as far as the coal market is concerned. The weather is mild and spring is rapidly approaching. This has been a mild winter all through the state and the demand for lumber has been lighter than any average previous year.

Prices remain unchanged and fluctuated little during the winter, the only increase being the usual $1 at the opening of fall known as the storage charge. Half of this charge was removed in January when it was noticed that the demand for fuel would be light for the remainder of the winter.

Production and Transportation Statistics

Norfolk & Western Ry. Co.

Comparative statement of coal and coke shipments over the lines of the N. & W. Ry. Co. for January, 1911-12, was as follows, in short tons:

Destination	1912	1911
Coal		
Tidewater, foreign	79,646	112,204
Tidewater, coastwise	204,623	248,219
Domestic	1,261,686	1,327,525
Coke		
Tidewater, foreign	12,347	4,556
Domestic	146,954	127,084
Totals	1,705,256	1,819,588

The following is a statement of commercial and company coal from mines on the Norfolk & Western Railway for January in short tons:

Field	Commercial	Company
Pocahontas	1,014,810	95,599
Tug River	131,984	35,314
Thacker	165,179	49,523
Kenova	67,526	10,070
Clinch Valley	107,966	9,977
Total	1,487,465	200,483

Foreign Markets

Great Britain

The labor situation having taken a more serious turn, many sellers are seeking higher figures for forward loading, but without finding buyers. Quiet conditions rule on the coal market today. Quotations are approximately as follows:

Best Welsh steam coal	$4.56@4.62
Seconds	4.38
Thirds	4.08
Best dry coals	4.50@4.62
Best Monmouthshire	4.20@4.26
Seconds	3.96@4.02
Best Cardiff small coals	2.78
Seconds	2.58

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those of Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½% discount.

The following is a comparative statement of the British exports for January, 1911-12:

	1911	1912
Coal	4,956,215	5,421,175
Coke	100,017	113,871
Briquetts	166,709	148,932
Bunker coal	1,564,738	1,516,659
Total	6,787,679	7,200,637

German Empire

Fuel production of the German Empire for the years 1910 and 1911 was as follows, in metric tons:

	1911	1910
Coal	160,742,272	152,881,509
Lignite	73,516,789	69,104,867
Coke	25,405,108	23,600,362
Coal briquettes	4,990,988	4,441,239
Lignite briquettes	16,836,679	15,125,777

Financial Notes

It is expected the Lehigh Valley Coal Sales Co. will formally engage in business, Mar. 1.

Board of directors, American Coal Co. (New Jersey), have declared the regular semiannual dividend of 3% payable Mar. 1, to stock of record Feb. 29.

Eleven first-mortgage, 5%, 50-year gold bonds of the O'Gara Coal Co., dated Sept. 1, 1905, for payment at 105 and interest, are called for Mar. 1.

In the organization of the Alabama Consolidated Iron & Steel Co. there will issue: $4,130,000 6% 20-year mortgage bonds, $1,032,500 6% cumulative preferred and $4,130,000 common, for which the syndicate will pay $4,130,000 less commissions. Both classes of stock will be represented by voting trust certificates. Alabama preferred stockholders will be assessed $60 a share and will receive in exchange $60 in bonds, $15 new preferred and $60 new common. Common holders upon paying $50 assessment will receive $50 bonds, $12.50 preferred and $50 common. Southern Iron & Steel preferred holders must pay $20 cash in order to receive $20 bonds, $5 preferred and $20 common in new company. The Southern common holders will be assessed $10 and will receive $10 each in bonds and common and $2.50 of the new company's preferred.

For the 12 months ended Dec. 31 last it is understood that Island Creek Coal Co. earned a balance for its 100,000 shares of common of slightly better than $2.25 per share after making liberal charges for depreciation and after meeting the $6 dividend on the 50,000 shares of preferred. The company, had it so elected, could have shown a common dividend balance of $3 per share or better. Conditions have been rapidly mending and the last four months of 1911 showed net earnings at the rate of better than $4 per share. It is expected that 1912 will show an output 35% greater than last year with more than a corresponding increase in net due to better prices. By 1913 it is the expectation of the management that production will very nearly touch the 3,000,000 ton mark. Island Creek is already the third or fourth largest coal property in West Virginia.